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The Manhattan Bridge.

The plans and specifications for the Manhattan Bridge, the design of which has been the subject of so much, and at times such acrimonious discussion, were described in The Engineering Record for July 29. The design of this structure has probably been more analyzed and criticized than that of any other bridge structure. Former Bridge Commissioner Lindenthal, it will be remembered, developed a well-considered set of plans for a nickel-steel eye-bar cable stiffened suspension bridge with rocking towers, which was favorably reported upon by a board of eminent experts. The late George S. Morison was a member of that board and his signature to the report was written on his death bed, indeed it was almost the last act of his life.

When the present municipal administration of the City of New York came into existence one of the earliest acts of the Bridge Department was the re-design of the superstructure as a wire cable stiffened suspension bridge with narrow high steel towers, but without the rocking feature, and with comparatively shallow stiffening trusses. The production of the plans of this bridge and that across the East River at Blackwell's Island involve the marked departure of combining architects' services with those of the engineer. This is worthy of comment because it indicates a movement toward more graceful design of the large bridge structures of American practice. The influence of the architects on the design of the Manhattan structure is evident without in the slightest degree trenching upon what may be termed its engineering efficiency. No portion of the structure has been slighted in its engineering design; in fact, there is probably not even a detail which has not been the subject of careful computation. In other words, the engineering design has been as drastically complete as the most ardent advocate of an ugly bridge could desire and in addition to that it has rational beauty. An interesting contrast may be drawn between the graceful outlines of the Manhattan Bridge with its well proportioned depth of stiffening truss and the clumsiness of the Williamsburg Bridge in which the main parts, excepting the cables, stand out with a bare and graceless rigidity conveying little else than an impression of harsh strength. A suspension bridge is, fundamentally, the most graceful bridge structure ever contemplated, and it is unnecessary, as well as irrational, so to design it as to give it the elements of maximum ugliness.

The feature of a relatively shallow stiffening truss needs obviously careful treatment. If the depth is small enough to give excessive flexibility within the limits of proper working stresses the usefulness of the bridge becomes impaired by too great motion, especially of the railroad tracks; at the same time the curve of the cable may be lost. A great depth of stiffening truss, on the other hand, has its marked and well understood disadvantages not only as to temperature stresses, but also as to the stresses and strains due to vertical loading. Mr. Morison made forcible and well-directed comments on these features of stiffened suspension bridge design in his memorable paper presented to the American Society of Civil Engineers shortly after the report of the North River Bridge Board, of which he was a member. The final design of the Manhattan Bridge shows that a rational depth of stiffening truss is entirely consistent with aesthetic requirements.

The length of span of this structure, 1,470 ft., is materially less than the 1,600-ft. span of the Williamsburg Bridge, and both are less than the known economic limit of application of cantilever design. Yet the far greater gracefulness of the stiffened suspension bridge undoubtedly justifies its adoption for the East River crossings where they must be made in one span. The relative economics of the cantilever and stiffened suspension systems are yet undetermined, so far as the lengths of spans to which they are respectively adapted are concerned. It is well known that the stiffened suspension design failed in its competition with the cantilever for the 1,800-ft. span of the Quebec Bridge, although it does not necessarily follow that the result might not have been different for the same length of span with different conditions of loading, and with other specifications. There are a number of elements of this particular problem of comparative economics, which yet remain to be determined.

The construction of this bridge with the towers so narrow longitudinally of the structure, necessitated by the original design of rocking towers, will furnish a course of highly interesting observations as to the movements of the saddles under varying conditions of stress in the cables. The saddles resting on 9-in. segmental rollers have a length of base of 30 ft. parallel to the axis of the bridge. The towers themselves, however, have a width of less than 20 feet where the roadway pierces them. Although they are of massive construction, such a small width in a longitudinal direction will make them relatively flexible. Variations in temperature as well as changing amount of loading may produce considerable changes in the positions of the saddles. Obviously the rollers on which they rest will afford the origin of perhaps the greater part of this motion. At the same time even rolling friction has some magnitude and there will be occasions when there cannot fail to be a tendency to give longitudinal movement to the top of the tower itself, within the elastic properties of its material. Some engineers have not hesitated to advocate attaching the cables directly to the tops of the towers and it is not unlikely that the Manhattan Bridge when completed will give opportunity for observations bearing directly upon such a feature of design.

The construction of the stiffening trusses of either nickel or high carbon steel, with the high working stresses permitted, is also an interesting portion of the work. Stresses as high as 40,000 lb. per square in. in tension members and others for compression and shearing in corresponding proportion are not common. On the whole, this great piece of structural work involves a number of unusual features, and its progress and completion will be worthy of close observation as they will undoubtedly yield results of more than ordinary value.

Yellow Fever at New Orleans.

The older readers of The Engineering Record will doubtless recall the epidemics of yellow fever in Gulf cities and the national attention drawn to them by their severity. The terrible experience of Memphis in particular was an occurrence that carried terror through the whole country. The great difficulty in the past of suppressing such an epidemic in the South in the summer time has been decreased by advances in our knowledge of the ways of fighting the spread of the fever. This fact seems to be overlooked, and as statements made in this journal twenty years ago are being quoted as authority for suitable precautions at the present time, it seems desirable to point out that the advice offered so long ago is not the best that can now be given. Thanks to the work of a small number of physicians in government service, yellow fever is no longer shrouded with mystery. We know that it is spread mainly, if not entirely, by a certain kind of mosquito, and if these insects can be exterminated an epidemic can be checked. The results of the sanitary work done at Havana during the American occupation prove that thorough sanitation enforced by police authority will keep the disease out of its reputed strongholds.

It is gratifying to learn that the federal government is in charge of the work at New Orleans. The local officers and physicians are unquestionably perfectly able to handle the situation except for one fact. A large part of the white population of the city consists of the lowest class of Italians. Naturally filthy in their habits, living in droves in dirt and squalor, and like wild beasts in their habit of concealing the sick members of their community, they are a serious menace to the health of the city. Their ignorant terror at the present time makes it necessary to put them under absolute control, and the politics of New Orleans are such that this can unquestionably be best done by federal authority. The fever was brought into the city by Italians and has been spread by their ignorant defiance of sanitary laws, particularly their vigorous opposition to medical inspection.

There is nothing whatever in the situation that need cause alarm. The fever is under control, our knowledge of its method of spreading enables it to be checked and stamped out, while it has appeared at a season of the year when it can be fought to best advantage. The lesson of the present epidemic is the necessity of a strict national quarantine against any introduction of fever patients or fever mosquitoes. This is as important now as it was years ago, when the national character of certain sanitary and health problems was recognized by Congress. The pitiful spectacle of the militia and naval reserves of two States drawn up in line of battle when they ought to be at home killing mosquitoes is one of those fiascos that cause Europeans to laugh at us. This occurrence in itself is sufficient proof of the necessity of federal management of all yellow fever outbreaks from the moment they are discovered.

If this epidemic teaches Southern cities to clean themselves, to adopt and rigidly enforce proper sanitary regulations, it will have had at least one good result. Sanitary officers in the South ought to have police powers, and ought to enforce them. Probably it will take many epidemics of yellow fever to awaken public sentiment to this fact, just as it will take many more typhoid fever epidemics to teach people the importance of pure water and good sewers. But the fact that such progress is slow must not discourage the reformer, for the record of the last twenty-five years shows that the sum of the many small advances is a very creditable total improvement.

The Telephone Situation in New York.

A brief mention was made last week of the fact that an investigation of the business of the New York Telephone Co. had been made by the Merchants' Association of that city, the result being wholly in favor of the company. The situation deserves further comment, for the investigation brought to light certain conditions that, while well known to technical men, were not appreciated by the public. In the first place, it should be stated for the benefit of readers not acquainted with affairs in New York, that the Merchants' Association is an organization of considerable importance which has taken upon itself the investigation of every subject, public and private, where it considers reform will be of benefit to the mercantile interests of the community. It has done much good work, and some that was very poor indeed. It has lately acquired the reputation of being hypercritical and for this reason its action on the telephone situation has attracted more than usual attention. In its investigations it has been given access to all the books of the company that it wished to examine, and these have been examined by the Audit Co. in its behalf. It has also been assisted by Messrs. Westinghouse, Church, Kerr & Co. as engineering advisors. Consequently its report is particularly worthy of attention.

There has been much complaint in the past about the charges for telephone service. Sometimes these complaints were due to the desire of some yellow journal for a sensational topic of discussion and at other times they seemed to have a foundation in the belief that the rates were really too high for the service rendered. The technical explanation for the rates is manifestly simple. Ten years ago there were 12,000 telephones in Manhattan and the Bronx, while today there are over 150,000. While this increase has made the telephone service much more valuable for the subscribers, it has also increased its cost very much. The number of central stations has multiplied rapidly in order that the efficiency of the service of all subscribers may be kept as high as possible, the lines have gone underground, and old apparatus has been scrapped whenever anything better was invented. The result is that the equipment and service are today the best in the world. It is so good, in fact, that the telephone is coming to be regarded as indispensable by all classes in the city. In Berlin there are 34.5 telephones per thousand inhabitants, in London 14.2, in Paris 18.5, in Vienna 12.1, while in Manhattan and the Bronx there are 65.1.

The charges for telephone service must comprehend the operating expenses necessary for the highest efficiency and for replacements, and a reasonable return on the actual investment necessary for the best service, including a fair allowance for contingencies. The technical advisors of the committee reported that the valuation placed upon the equipment in the company's books was reasonable and conservative. Its investments in real estate and in the securities of the company owning the subway system for wires were found to be essential for the conduct of its business. The expense accounts are stated to have been handled with the same care that is shown in a well-managed private mercantile business. The outlay for replacements was approved by the committee as showing nothing more than a proper appreciation of the importance of new types of equipment. The net earnings which the committee considered justifiable for a business of this nature were 10 per cent. and the rates of the company have accordingly been voluntarily reduced so as to make them yield that amount.

The basis of charges should be the service rendered. This is recognized in the gas industry, but only partly in the water and telephone industries. The telephone rates in New York are now almost wholly on the basis of the number of calls, with an extra charge for long-distance connections. This is approved by the Association's investigation committee, and it may be remarked parenthetically that it is a pity the same committee could not be appointed to report on the system for charging for water in New York. It is well known that the bills for telephone service are increasing considerably in the offices of each subscriber, and the feeling has been aroused that this was due to the manner of charging up the calls made by the subscriber. The committee goes into this matter quite thoroughly and reaches the conclusion that the system now in use for recording calls works against the company rather than the subscriber. The increased bills for telephone service are due to the greater use of the apparatus, not only for legitimate business purposes but also for all sorts of conversation by the minor grades of employes, which is now forbidden in some offices.

The most important fact brought out by the report is the wholly impracticable nature of any attempt to introduce improvements by securing competitive telephone service in any city, and the impossibility of comparing the rates in two cities for the purpose of securing information concerning their relative fairness. The committee found that in in the eighty American cities having populations exceeding 50,000 the ratio of residence telephones to the total number varied from 15 to 71 per cent., of party line telephones to the total number from 4 to 84 per cent. of private branch exchange telephones to the total number from 1 to 41 per cent., and of extension telephones from 1 to 13 per cent. In some cities the location of the subscribers is such that a few central stations answer the purpose, while in others many are needed. In Brooklyn, for example, it is necessary to have seventeen. From a study of these and similar data the committee reaches the very sensible conclusion that "there is no common factor or unit of measure by means of which, through comparison with other cities, sound conclusions as to the reasonableness or unreasonableness of the telephone rates in any city can be reached." This decision is a perfectly true one, and deserves to be considered in any discussion of the subject.

Should an Engineer Begin his Career in a Foreign Country?

To the young engineer, full of life, illusions, and desire for adventure, the allurements of an offer of employment in an uncivilized or a foreign country are hard to resist. Just out of college, he is usually more in need of money than he will ever be later on, and the pay offered him abroad is greater than he can at once command at home. He dreams of the vast wealth of the unexplored territory for which he is about to sail, and he is perfectly certain that in addition to his pay he will find some opportunity for making a fortune if he is only on the ground before the country begins to leap forward in response to the push of enterprise in which he hopes to have no small share. He recalls the names of Pizarro and Cortez, and the fabulous wealth of the countries which they explored and which made them famous. He does not recall their hardships, nor does he stop to think that of all the countless thousands of brave young spirits, who, like himself, yielded to the temptation to leave their native land, perhaps a score still live in history, while the rest died unknown.

The young engineer probably never stops to think that the countries discovered by Pizarro and Cortez are today, centuries afterwards, almost uncivilized; that their wealth was always enormously exaggerated; that it is almost an invariable rule that a gold mine gets richer and richer the further one gets away from it, and poorer as one draws near; and that where there is no business activity, no trade, no manufactures, no commerce, there is also no market for brains or push or energy. Nor does our young man realize that there is probably no spot on the face of the globe which has changed and developed more than Manhattan Island; and he is hardly old enough to remember that west of Central Park, and from its south line almost up to Harlem, there was thirty-five years ago scarcely a building save those of the Bloomingdale Insane Asylum and the scattered shanties of a few of our recently acquired citizens of a race whose preference in family pets leans to pigs and goats.

But youth will not be denied, and so the young engineer sails away full of health and hope and courage, and confidence in himself and in his fellow men. These are all fine things to have, and to lose them goes hard with a man; yet it is probable that no man ever returned from such a trip with as full a measure of any of these sweet and pleasant qualities as when he started. Our young engineer has many friends, and their interest in him and in his departure puts him in the center of the stage, makes him the hero of the hour, and sheds a glamor over the parting that keeps him from feeling its bitterness. The sea voyage out is delightful, though it does begin to get rather warm as his ship, bound, let us say, for South America, nears her port. The sights and sounds about the landing place, while by no means attractive, at least have the merit of novelty. For a time, learning the new language gives pleasant and profitable occupation. The duties of his new position are entered upon with earnestness and zest, and our young man welcomes his first chance to show what is in him.

Somehow or other things do not seem to get done. Material, promised and confidently expected for a certain time, does not arrive, or arrives in bad and unusable condition. The men are slow. He cannot make them understand, nor trust to them to keep on working while he is away. The feast days or holidays come so often that he can never hope to know whether he will get one or six days' work done next week. He would be desperately homesick and lonely if he were not so desperately worried and disappointed at his failure to push his work as fast as he had hoped to do.

After a year or so of this sort of thing, if he has been able to stand it that long, he will have reached the parting of the ways. It is now to be seen whether he will take the advice offered him on every hand by the lazy natives, and stop worrying and let himself drift along as they do; or whether he will be man enough to rally what is left of his health and hope and courage, get through somehow the work before him, and then, as soon as he can, return to the United States and start over again. The former course will spell ruin for him; if he choose the latter, and choose it in time, he will have only lost a year or so of his life, and he will still have many more to live.

If, on his voyage home, the young engineer takes stock of himself, his account for the year will stand about as follows: He has learned a new language, but he will never use it at home. He has, perhaps, saved a few hundred dollars; cowboy like, he will feel abundantly justified in treating himself on his arrival to all the good things of which he has been so long deprived, so that his money will be gone by the time he gets another job. He has had a novel experience, and has seen some things that most other men have not seen. This may gratify his pride, and give him food for anecdote or story in years to come; but it will not help him in his life's real business. He has learned how to do certain sorts of work with practically no appliances, and to manage, after a fashion, a certain class of laborers. In his work in the United States he will never have to do with that class of laborers; and he will be called upon to work with all sorts of tools and appliances, whose use he has not learned. He has lost touch with his old friends. The ones he has made abroad were not in his class. They were, perhaps, good fellows in their way, but beneath him in birth, intellect, morals and race. He could not bring them up to his level, so he must have sunk a little toward theirs. This item is a total loss.

On the whole, he has profited nothing; and as he who stands still in the race falls behind, he may be said to have gone back in his career by just the length of time that he has been away from his native land. If he shall have done no worse than that, and shall yet have kept his health practically unimpaired, he will still have been more fortunate than 90 per cent of the young Argonauts who, like him, have voyaged in search of riches and adventure.

Recent Improvements in Derricks and Derrick Cars.

Within a comparatively short time there has been a marked increase in the dimensions and capacities of derricks and derrick cars, and so many improvements have been made in their design and operation that it is now advantageous to use them for the erection of viaducts and girder spans in many cases where falsework, gallows-frames or elaborate overhanging travelers have heretofore been employed. These latter appliances were usually constructed of wood or of wood and steel, and were generally built specially for the erection of a single structure or group of structures, after which they were dismembered and yielded comparatively small salvage. This required considerable time for the preparation of the erection plant and involved expense for labor and materials, which was repeated for every job.

With the rapidly increasing dimensions of long-span bridges and the corresponding lengths and weights of their principal members, as well as a similar development of the girders and columns in steel buildings, it has been found advantageous to build special steel derricks to correspond, which become regular tools in the erector's plant and are available for the erection under favorable circumstances of most girder spans which are within the limits of railroad shipment. Their stresses are accurately computed, their details are as carefully designed and their materials are as good as the best railroad bridge work, so that their safety is assured. They are always ready to be shipped with the bridge spans, like the hoisting engines or other standard plant, can be quickly erected and do not suffer from being assembled and taken down, as wooden travelers are likely to. They are lighter than timber, can be made stronger, more neat, and are much better adapted to very heavy work; therefore, their use is in many cases both economical and convenient.

A number of railroad and bridge companies have constructed derrick cars and wrecking cars able singly or in pairs to unload and erect long and heavy girders and girder spans, and one bridge company has built special stiff-leg steel derricks with 60-ft. masts and 75-ft. booms rigged with special blocks and tackles of 65 tons capacity. Another bridge company has developed standard steel derricks ranging in capacity from 12 to 40 tons and so arranged that they can be used as stiff-leg derricks with 30-ft. masts and either 30-ft. or 50-ft. booms, or can be arranged as guy derricks with masts about 60 ft. long and 65-ft. booms, or with 60-ft. masts and 50-ft. booms, where it is necessary to swing under the guys.

Notes and Comments.

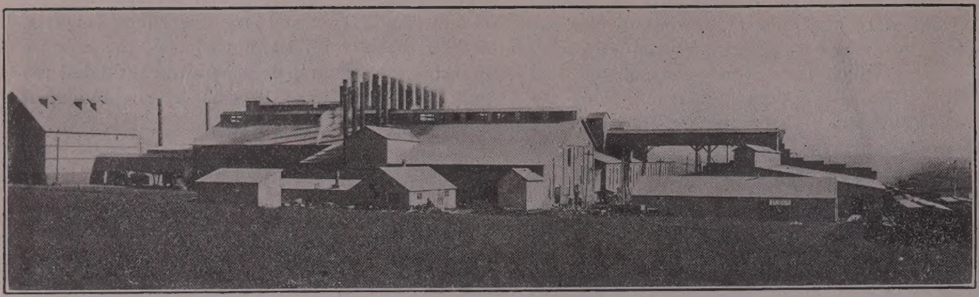
The Sewage Pumping Station at Winchester, England, recently opened, is interesting because the steam is raised in boilers heated by the gases from refuse destructors. The pump is a triple expansion Worthington engine rated at 140 h.p. There are four destructor cells of the Manlove, Alliott & Co. type, in which are burned the screenings from the sewage before it enters the pumps as well as the usual refuse of a town of 21,000 population.

Transportation by Traction Trains seems to be attracting considerable attention in Queensland, and the Department of Commerce and Labor has recently published an interesting article on the subject by Consular Agent Weatherill, of Brisbane. After an examination of equipment made in America and Europe, British traction engines were adopted as being stronger than any other. Nine routes with a total length of 1,142 miles will be covered by these trains; water can be obtained every 20 miles and there is plenty of wood for fuel. The roads are very dusty, and at certain seasons are impassable on account of deep, sticky mud. They impose unusually severe conditions on the traction engines, and American machines are considered too light to meet them successfully. The adopted type has a hauling capacity of 10 tons on Queensland roads. The engines will run in pairs, one being equipped with wood-sawing machinery for supplying fuel and a 30-ton steel hawser for use in passing bad places on the road. Steam at 225 lb. is used in compound engines. The excellent service done by traction engines in military operations is proof of their capacity for hard work, but the expense of such transportation is generally considered too great to warrant its adoption as a commercial proposition.

The Selection of City Engineers in Great Britain is often made by public competition. When such an office is vacant, as is now the case in Leeds and Newcastle-upon-Tyne, an advertisement of the fact is made in the technical journals. The salary to be paid and the restrictions as to age and outside engagements are stated. Candidates are expected to file definite statements of their experience and qualifications, but, as a rule, not more than three testimonial letters are permitted. When the date for opening the applications has come, they are carefully considered, the qualifications of the most suitable candidates are investigated, and finally the best man is appointed. If he has previously been connected with the city engineers department, he is promoted to its chief position, but not otherwise. The whole procedure seems to be an excellent one to secure the best possible men, and it is unfortunate that it is not introduced on this side of the Atlantic.

A Brick Facing is used on the Cray dam of the Swansea water works. This is a structure of cyclopean masonry rising about 100 ft. above the river bed. The facing has an average thickness of 18 in. The outer part is pressed blue facing brick and the remainder the best grades of brindled brick, all laid in 1:3 cement mortar. It was originally intended to use a stone facing, but the expense of dressing the available stone was so great that this course was considered inadvisable. Before adopting the brick facing, the borough engineer, Mr. R. H. Wyrill, visited the dam at Remscheid, described several years ago in this journal, where such a construction has been followed, and investigated the similar facing on a dam at Rhayader. He also conducted numerous experiments on the relative tightness, durability and resistance to frost of stone and brick. The possibility of employing a rich concrete facing does not seem to have been considered, although this construction has lately been adopted for some important dams in the United States.

The Registration of Architects in Great Britain is the subject of a bill fathered by the Royal Institute of British Architects, which will be pushed along the much obstructed road to eventual enactment by Parliament, provided its advocates do not change their views as they grow older. Legislation is accomplished slowly in Great Britain and before the older architects who object to be licensed, like dogs, are required to take out their papers, a good many years are likely to pass. The main object of the bill is stated as follows: "To enable persons requiring professional aid in the design and construction of buildings to distinguish qualified from unqualified practitioners, and to prevent untrained and incompetent persons styling themselves architects, from imposing on the community to its material loss, danger and detriment." Theoretically, the object of the bill is all right, but practically it amounts to nothing. The only way to prevent unsafe construction is to adopt the equivalent of the Prussian police laws governing building construction. When any unsafe construction comes to light in Prussia the police machinery is put in motion and it can only be stopped when both architect and contractor for that piece of work are ground up and cast into the sewer. Nobody dares to put up unsafe buildings in that kingdom, and the same wholesome fear is the only thing that will prevent unsafe construction elsewhere.



View Looking Toward Shops and Power House.

THE WORKS OF THE KANSAS PORTLAND CEMENT CO.

By Ellis Soper, Hunt Engineering Co.

The Portland cement industry in Kansas has been looked upon by the Eastern manufacturers and the public in general as a lucrative proposition financially on account of the natural advantages existing in gas as fuel in this district. The mystery that has surrounded these plants to some extent is due principally to the fact that nothing heretofore has been written on the industry in this section. Rumors of fabulous earnings, abundance of raw materials and fuel, and a great capacity at low cost of production have attracted widespread attention to this State. However, as a matter of fact, conditions are the same here as in any other district, and are inferior as regards the market because of the scattered population. The combination of lime and shale is to be found in nearly every other state in the Union, thus leaving the matter of advantage over other districts to the question of fuel. This, however, is not such an advantage as it may appear on the surface, because industries of any magnitude must fortify themselves against future contingencies by holding a vast acreage and maintaining extensive pipe line systems, exclusive of the expense of drilling the gas wells. The matter of free fuel is so attractive to a large user like the manufacturer of Portland cement that he loses sight of the other conditions to be considered, including the large investment necessary to secure a sufficient gas supply and reserve, to lengthen the life of his source of fuel.

It must not be construed from this article that the companies already in the field have not been successful, for they have had a marvelous growth, but their success has been due to a fortunate combination of circumstances. Being pioneers, they were enabled to obtain large tracts of the best virgin gas territory in the defined field, and the existing high prices for cement in this territory at the time, with foreign cement in competition, together with a fortunate solution of the problem of handling the independent raw materials, contributed to their remarkable growth. Their methods of reducing the raw materials is peculiarly adapted to those at hand, resulting in an exceptionally high grade article at a cost that favorably competes with those obtaining in the Lehigh Valley district. With the high reputation it gained and the prevailing high selling price, the Iola Portland Cement Co. was enabled to become so fortified as to hold the majority of the trade, even after this district became the dumping ground for the overcrowded market in the East.

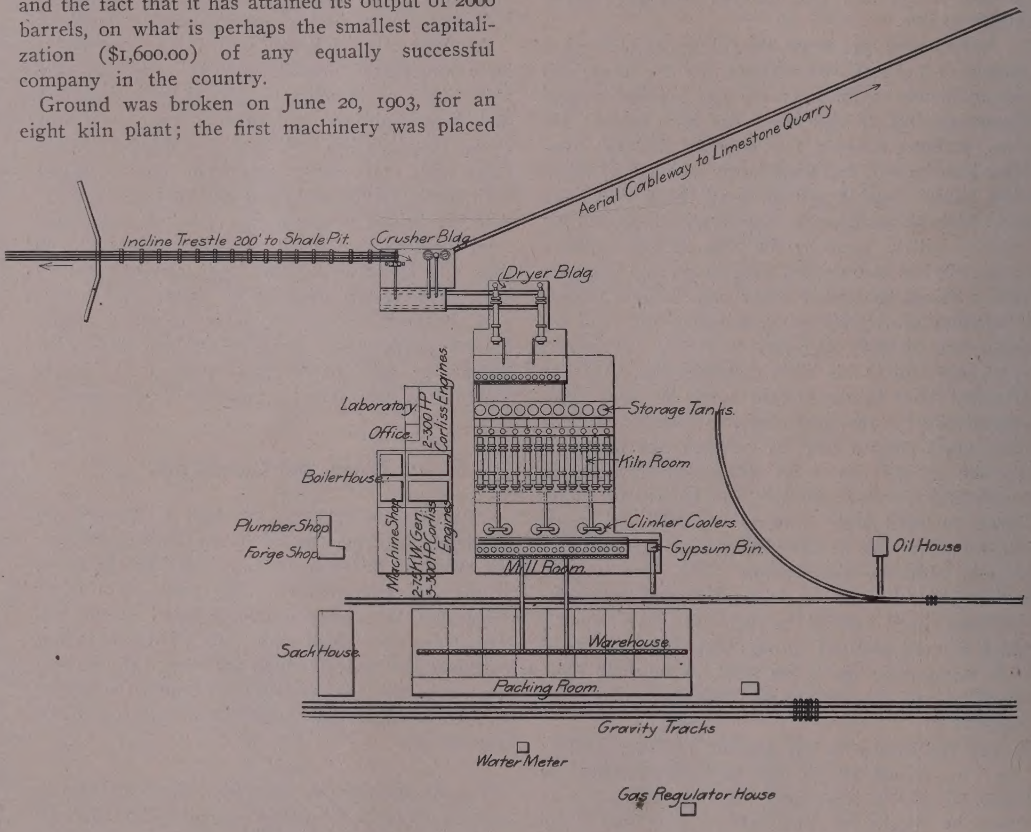
The Iola Portland Cement Co. may be truly called the pioneer company of this district. Its marked success stimulated the business men of Iola to further develop the natural resources of their vicinity, and resulted in the organization of the Kansas Portland Cement Co. of that city. No better illustration of the progressiveness of the West can be mentioned. The organization of this company, under the laws of West Virginia, April 10, 1903, was not accomplished by speculative promotors, but was the result of the efforts of men of sound judgment and demonstrated business ability, and its great success has been due principally to the organizers and present officers, who are: Geo. E. Nicholson, president; Baldwin, Kan.; A. B. Cockerill, vice-president, Nevada, Mo.; W. S. Goodin, secretary, Iola, Kan.; L. L. Northrup, treasurer, Iola, Kan.; E. C. Champion, superintendent; E. E. Ware, chief chemist and F. L. Woods, assistant superintendent. The features in the growth of this company have been the conservatism of its organizers and the fact that it has attained its output of 2000 barrels, on what is perhaps the smallest capitalization ($1,600.00) of any equally successful company in the country.

Ground was broken on June 20, 1903, for an eight kiln plant; the first machinery was placed on the foundations, on Sept. 20, and the first clinker was burned on Feb. 4, 1904, being 7 months and 14 days after excavation work began. The balance of February was devoted principally to adjusting machinery and completing other departments, and on March 1, the plant was started in full operation. Its first full month's output was 86 per cent. of the average production obtained during the next six months, and the starting-up cost was but 20 per cent. higher than the succeeding month's cost. The variation of the output by months has not exceeded 1½ per cent. since the first month of operation.

It is a singular fact that at but one point in the process was the plant altered from the original plans, and at this place alone, because of the failure to do its work, the only step of any importance occurred. Gravity handling is utilized wherever possible, and the general and even output has been due to the distribution of storage throughout the various departments and to gravity handling instead of machinery as a means of elevating and conveying. The success of this plant certainly proves that in the design and construction of a strictly up-to-date Portland cement mill, the course of the material throughout the mill must be as direct as possible, the use of conveyors and surplus machinery should be reduced to a minimum, and simplicity must be observed at every point, in order to obtain the least cost of production.

Raw Materials. The limestone is called the Iola limestone; it is very hard and compact, and is quarried in the usual manner. A typical analysis is as follows: $SiO_2 = 1.1$; Al_2O_3 and $Fe_2O_3 = 1.8$; $CaO = 51.7$; $MgO = 2.0$; $SO_3 = 0.06$; loss $= 43.3$. The quarry is located 2,250 ft. from the crushing plant and the limestone is transported by means of 1-yard buckets traveling on an aerial tramway of the Broderick & Bascom type.

The shale is excavated by a steam shovel which discharges into small cars. These are attached to a wire cable and draw up a trestle about 200 ft. in length and one degree incline. The contents of the cars are discharged into two No. 3 Williams pulverizers. The shale analysis is as follows: $SiO_2 = 55.5$; Fe_2O_3 and $Al_2O_3 = 24.4$; $CaO = 4.7$; $MgO = 2.1$; $SO_3 = 0.34$; loss $= 9.3$.

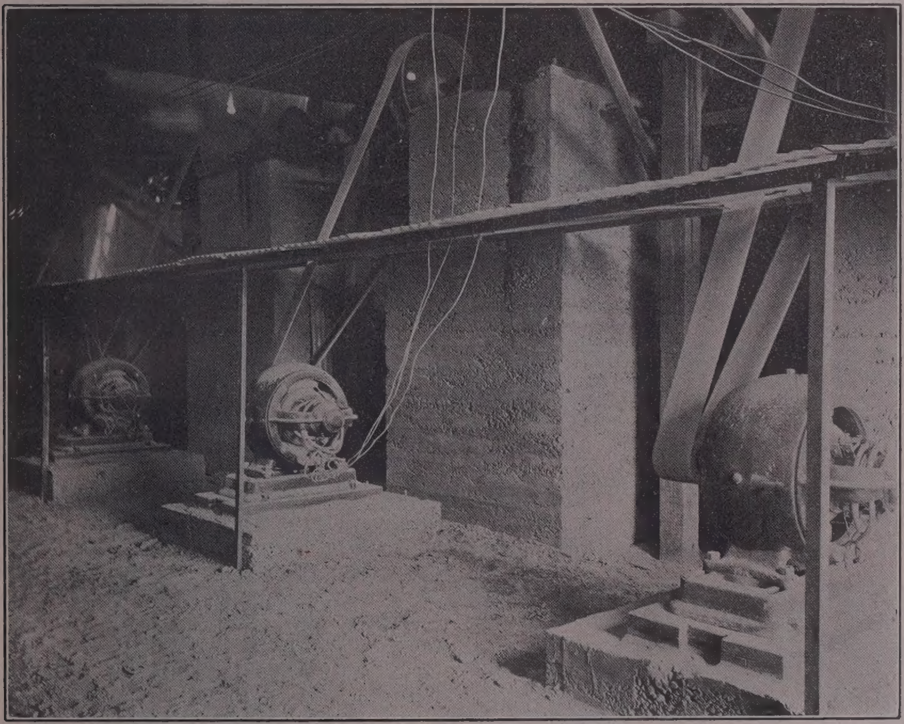


Plan of the Works of the Kansas Portland Cement Co.

From the pulverizers, the shale is elevated to storage bins of three days' capacity. The limestone is crushed by one No. 8 Austin crusher so that 50 per cent. passes through a revolving 1-in. screen. The unscreened portion is further reduced by a No. 5 Austin crusher and elevated to the storage bins. These bins discharge into steel cars, so proportioned as to receive approximately the correct amounts of limestone and shale. These cars move by gravity across a set of weighing scales into the dryer building, where their contents are elevated to two 5 x 50-ft. rotary steel dryers, equipped for two-thirds of their length with Z-shaped shelves, which aid in mixing and drying the materials. Heat is furnished by ordinary gas burners.

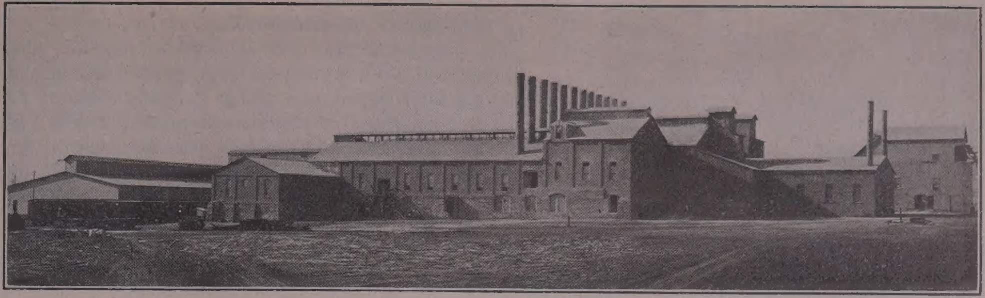
Raw Grinding Department. From the dryers the mixture is elevated to immense brick bins; in case the bins are full, the material is discharged onto the floor, forming a reserve storage. The raw mix is fed from these bins into twelve Griffin mills from which it is elevated into ten steel tanks. The raw mix is fed from these tanks by gravity into twelve large rotary kilns, of United Iron Works and Bonnot type. The kilns are driven by Northern Electric individual, variable-speed motors, which enable the burners to secure a variation of from 1 revolution of the kiln in 45 seconds to 1 revolution in three minutes.

The clinkers are burned by natural gas and air, which is furnished by two Buffalo forge blowers, the gas being fed into the air current through patent gas burners, furnished by Tate, Jones & Co. The flame is introduced into the kiln through specially built combustion chambers attached to the kiln housings. The clinker falls from the kilns into six brick pits, which in turn discharge into three inclined elevators and these into six vertical, stationary coolers. Should the coolers be full, the clinker falls onto the large storage pile in the clinker room. The clinker is elevated from the coolers to steel bins, which discharge into twenty Griffin mills for reducing and finishing. Two per cent. of gypsum is added to the clinker from small steel cars operated on a track on the clinker bins for the finishing mills. The cement is conveyed and elevated to two 24-in. belt conveyors, 90 ft. on centers. These discharge into 12-in. screw conveyors, which distribute the finished product into ten 10,000-barrel storage bins. The cement is packed by a specially built sacking machine, furnished by the United Iron Works, and is loaded on the cars, which operate on gravity tracks.



Variable Speed Motors Driving Kilns

Power Plant. Power is furnished by two 750-h.-p. Monarch Corliss non-condensing engines, built by the Strait Manufacturing Co., Kansas City. Line-shaft transmission is used throughout the plant, except at the kilns and for drives of over 40 or 50 ft., where the American system of rope transmission is used. The current for electric lighting and the motors is furnished by two 75-kw. Wood generators, furnished by W. T. Osborn & Co., Kansas City. The boiler plant consists of sixteen Springfield fire-tube boilers. A very poor quality of water is used, but very little trouble has so far been experienced as a result of its use. A pumping station, consisting of a boiler and a large duplex pump, is located ½ mile from the plant, and furnishes water for boiler and fire purposes. A very complete and efficient system of fire protection is maintained. Natural gas is burned under all boilers, thus securing the greatest efficiency with the least fuel consumption. A very complete machine shop and forge shop is maintained, and all materials for repairs and machinery are finished here.



View Looking toward Kiln Room.

Chemical and physical laboratories are maintained, and accurate analyses are made of each tank of raw mix and bin of each finished product. The following is an analysis of the cement: $SiO_2 = 22.4$; $Al_2O_3 = 6.8$; $Fe_2O_3 = 2.9$; $CaO = 63.4$; $MgO = 1.8$; $SO_3 = 1.35$; loss = 1.00.

The elevating and conveying machinery, coolers, steel tanks and bins, dryers and eight kilns were furnished by the United Iron Works; four kilns of the straight type were furnished by the Bonnot Co.; all shafts, bearings, ropes, drives, etc., were furnished by the Dodge Mfg. Co. The New York Belting & Packing Co. furnished the transmission and conveyor belts.

On July 1, 1904, the stockholders felt the necessity of increasing the output, with a view of decreasing the cost of manufacture, as well as to supply the demand created in this short space of time by the high quality of cement produced. It is a singular fact, that not one barrel of its cement has been rejected, and it has found its way into government, railroad and other important work.

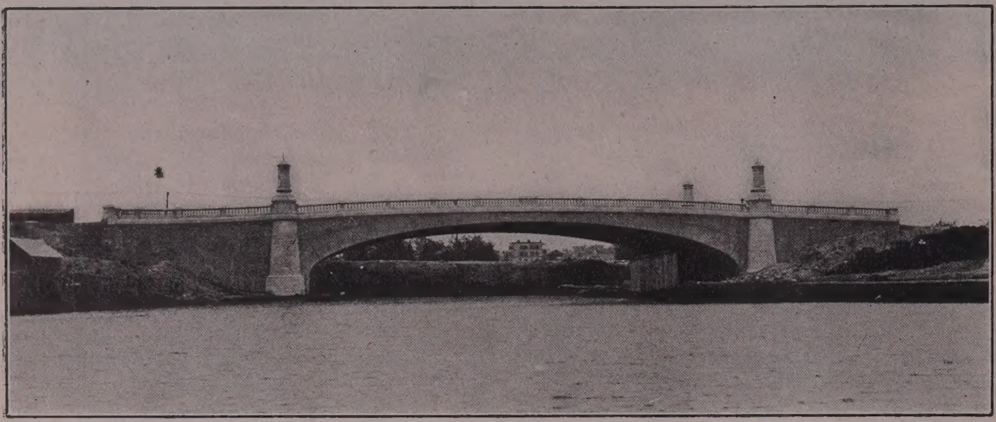
The rapidity of the original method of construction is very apparent in the following: Ground was broken 12 days later (July 12) for a four-kiln extension, or completion of the first design, carrying out the original plan for the twelve-kiln plant. This extension is represented by an increase of the crushing plant, raw grinding machinery, kilns, cooling and grinding capacity, as well as concrete and steel gypsum bins, etc. The original engines are of sufficient capacity and required only an increase of boiler plant. Other additions were the installation of four electrical units and 20,000 barrels additional storage capacity for finished product, and procuring additional fuel and water supply. This work, having the benefit of machine shop facilities and an overstocked market of machinery, although a complete four-kiln plant, turned out its first clinker in 62 working days. The plant was designed and built by the Hunt Engineering Co., Iola, Kan.

The Guanajuato Flood in Mexico.

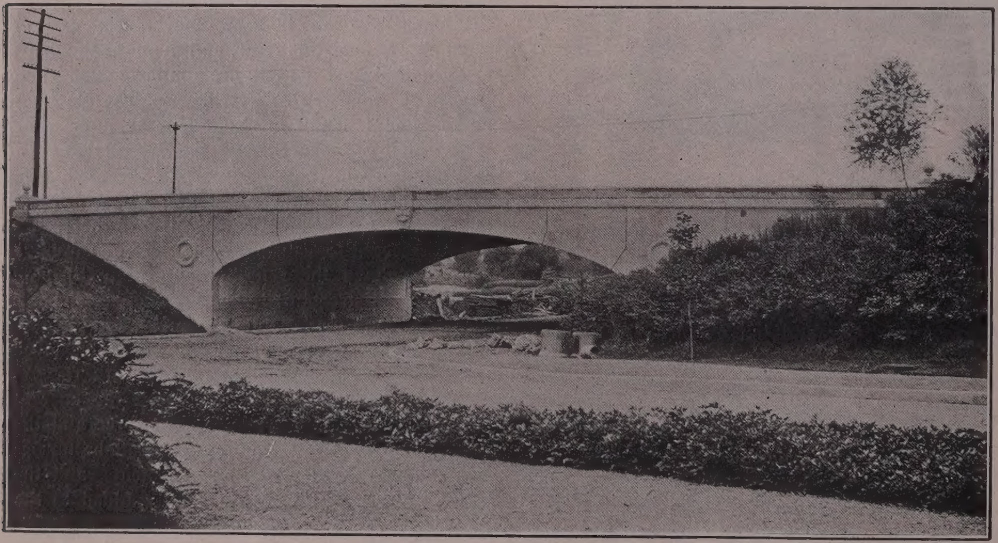
The Guanajuato flood in Mexico a few weeks ago was reported to have been attended by the bursting of the Chiquita dam. This report is entirely erroneous, as no dam in the vicinity of the city developed any weakness or failed, according to Mr. C. W. Van Law, of the Guanajuato Reduction & Mines Co. He states that the flood was due to an enormous rainfall which occurred over an area large enough to include the majority of the branches of the main stream which comes through the Guanajuato valley. The streets of Guanajuato are, in very many places, carried upon arches over this river, and many of the principal buildings of the city are similarly supported. The flood came with a terrific rapidity, reaching its maximum height in about half an hour after the rainfall commenced ,and the destruction of a few buildings in the upper part of the town furnished an accumulation of debris which effectually and almost instantaneously blocked the arches above referred to, causing the volume of the flood to raise above these arches and pour through the principal streets of the city. The consequence was a sudden inundation of the parks, and in many of the public streets, normally above water level, the water reached a height of 10 to 12 ft. As many of the streets are very steep the current through them was correspondingly fierce and the destruction of masonry or plastered adobe houses was the work of only a few moments, and the amount of debris thus made merely added to the destructive power of the current. The street railway connecting Guanajuato with the railroad port of entry, Marfil, was largely destroyed, the river completely changing its course and washing out the entire bottom of the valley. The estimated real damage, now that time has been had for careful estimates, is approximately $1,000,000 (Mex.), covering only, however, damage to buildings and the stocks therein, and without including indirect losses or loss of personal valuables which it is difficult or impossible to estimate.

Reinforced Concrete Bridges in a Newark Park.

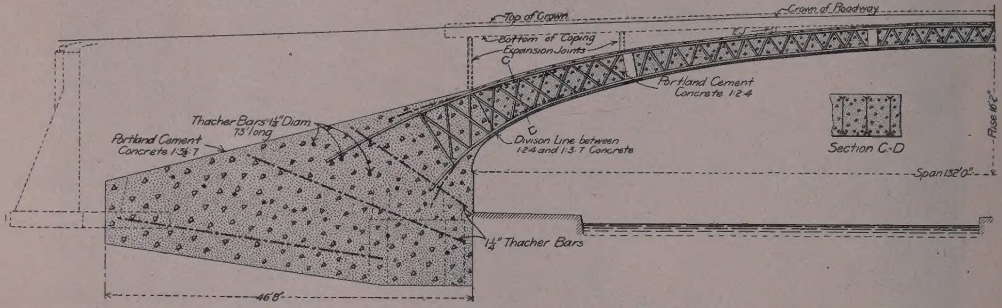
Two large reinforced-concrete, single-arch bridges of monumental design have recently been built in Branch Brook Park, Newark, N. J., on two main highways leading across the park from the city to several suburban towns. Branch Brook Park has been developed recently and is the principal park in Newark, but the two highways divided it into three separate parts, the drives and walks connecting the divisions crossing at grade on the highways, one of which carries a double-track interurban electric railroad. The arch bridges will carry the highways over the walks, drives and waterways that are being constructed to connect the separate parts. They are of the Melan type and were designed to conform to the surroundings, special attention being given to the development of their architectural appearance and surface finish.


The Park Avenue Bridge Before Grading Work was Completed.

The grades of the highways were so nearly the same as the lowest grade that could be established easily for the park drives crossing beneath them that, although they were raised considerably in order to avoid too steep grades on the approaches, the arches had to be built with as slight a rise as possible. At the same time the necessary clearance between the intrados of the arches and the grade of the park drives limited the thickness of the arch rings. It was also particularly desirable to have single-span bridges. Reinforced-concrete arches were considered to be at least as cheap as any other type of construction that would fulfill these requirements, while the concrete was held to be capable of treatment that would lend the proper character to the appearance of the structures.


The Bloomfield Avenue Bridge Showing Park Drives and Sidewalks Beneath It.

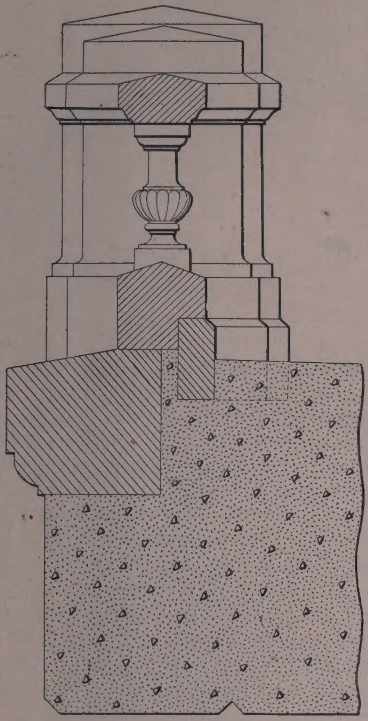
One bridge has a total length of 243 ft. 7 in., is 74 ft. wide and has a clear span at the springing lines of the arch of 132 ft., with a rise of 16 ft. 2 in. and a maximum clearance of 22.5 ft. It has a 40-ft. roadway, with a 15-ft. sidewalk on each side. The other bridge has a total length of 154 ft., is 69.5 ft. wide, and has a clear span of 70 ft. at the springing lines, with a rise of 8.5 ft. and a maximum clearance of 15 ft. It has a 39.6-ft. roadway and two 13.2-ft. sidewalks, with two tracks of the electric car line in the roadway. The longer bridge is on Park Ave., and its general appearance before any grading had been done around the wing walls and before a waterway had been cut through beneath it is shown in one of the illustrations. The shorter bridge, on Bloomfield Ave., is of practically the same design.


Top of Crown
Crown of Roadway
Bottom of Coping
Expansion Joints
C
D
Portland Cement Concrete 1:2:4
Thacher Bars 1¼" Diam. 73' long
Portland Cement Concrete 1:3½:7
Divison Line between 1:2:4 and 1:3:7 Concrete
Section C-D
Rise 16'2"
Span 132'0"
1¼" Thacher Bars
46'8"
Half Sectional Elevation of the Park Avenue Bridge Showing Reinforcement.

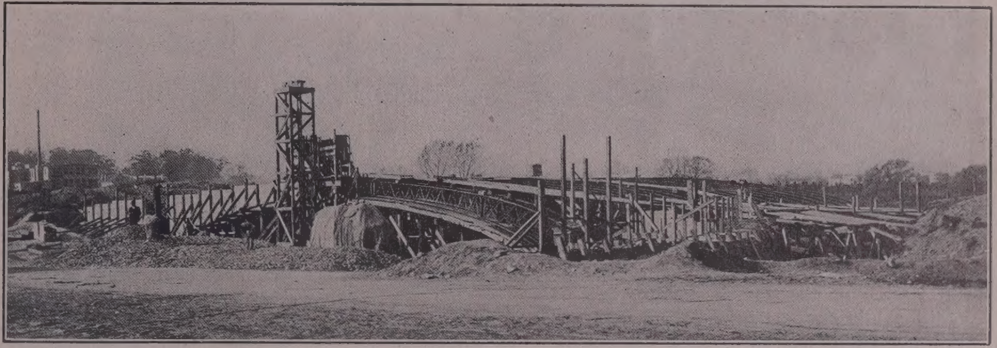
The embankment which appears beneath and beyond the arch in the view of the Park Ave. bridge is the original site of Park Ave., which was a straight street at about the distance shown above the grades of the drives. The bridge was built about 100 ft. to one side of the old street alignment and parallel with it, the street being curved to meet it at each end in order to relieve the appearance of a straight drive through the park and to reduce the grades on the approaches. The embankment of the old road is being removed and the waterway will be extended to connect with a lake in the division of the park beyond the bridge. A macadam walk will be laid on one side of this waterway and a macadam drive and walk on the other side, forming, with the drives and walks to be laid under the Bloomfield Ave. bridge, continuous communication from one end of the park to the other.

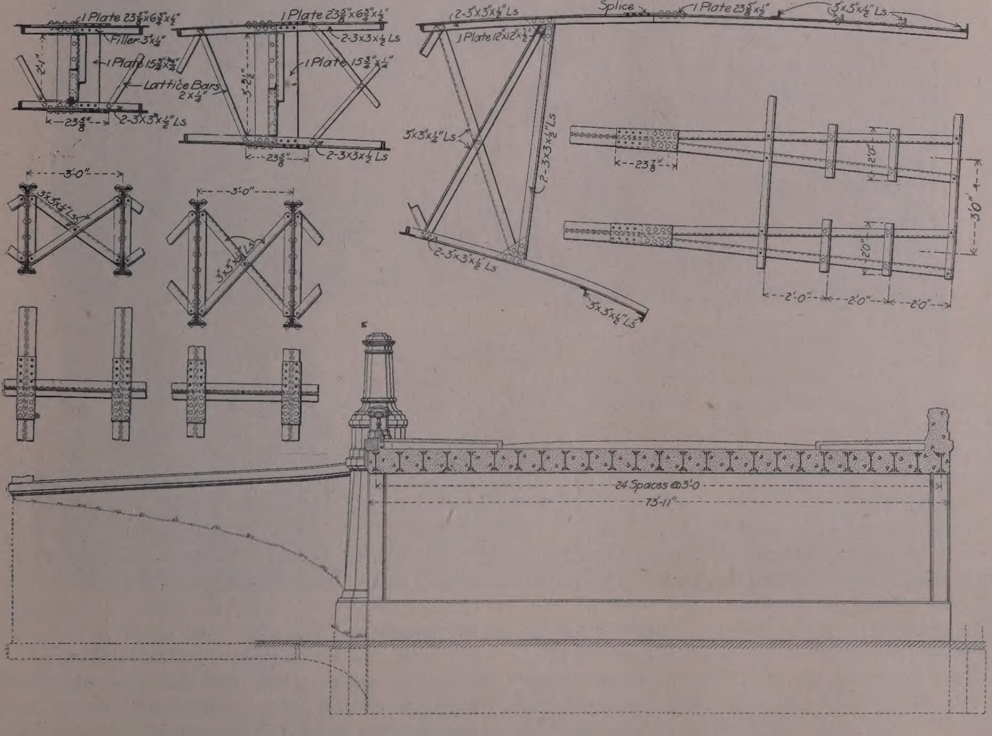
The Park Ave. bridge was designed under the following conditions: Dead load, concrete, 150 lb. per cubic foot; fill between the spandrel walls, 120 lb. per cubic foot; pavement, 150 lb. per cubic foot. Live load for roadway and sidewalks, 150 lb. per square foot. Modulus of elasticity of the concrete, 1,500,000 lb.; of the steel, 30,000,000 lb. The allowable compressive stress on the concrete, exclusive of temperature stresses, was 500 lb. per square inch; the allowable tensile stress, exclusive of temperature stresses, 50 lb. per square inch, and the allowable shear 75 lb. per square inch. The reinforcement of the arch is arranged according to the Melan system and consists of vertical steel-truss ribs, built up of structural shapes and spaced as shown in one of the illustrations. The ribs under a stress not exceeding 18,000 lb. per square inch are required to be capable of taking the entire bending moment of the arch without aid from the concrete. They have a flange area of something more than 1/150 part of the total cross-sectional area of the arch at the crown, and the steel in them, with the exception of the rivets, which have an ultimate strength of between 54,000 and 62,000 lb. per square inch, has an ultimate strength of between 60,000 and 68,000 lb. per square inch. The arch is additionally reinforced at the ends by rows of 1¼ in. Thacher bars, perpendicular to the axis of the arch ring near the intrados and extrados. Transverse and longitudinal rows of 1¼ in. Thacher bars are also placed in the abutments perpendicular to the lines of thrust.

Three grades of concrete were employed in the different parts of the bridge, Alpha Portland cement being used exclusively, with broken trap rock and clean bank sand. The following proportions were used in the various parts of the structure: In the arch ring, 1 part cement, 2 parts sand and 4 parts broken stone that would pass a 1½-in. ring; in the spandrel walls and the wing walls of the abutments, 1 part cement, 3 parts sand and 6 parts broken stone that would pass a 2-in. ring; in the abutments, 1 part cement, 3½ parts sand and 7 parts broken stone that would pass a 2-in. ring. The concrete was mixed quite wet in a Ransome mixer and was well tamped into place in the forms. The coping, balustrades and pilons are artificial stone manufactured by the Standard Stone Co., of America, Mr. J. C. McClanahan, president. These stones were cast in sand molds in the shop and shipped to the site when they had set sufficiently. They are composed of 1 part Portland cement and 2 parts sand, and were required to have an appearance when in place equal to that of cut Indiana limestone. The larger blocks were cast hollow and filled with Portland cement concrete after being placed. Practically no difficulty was experienced in casting the blocks to the proper size, and their surfaces have an unusually smooth and uniform appearance.


Detail of Balustrade, Park Avenue Bridge.

The exposed surfaces of the structure are faced with about 1½ in. of Portland cement mortar, laid simultaneously with the concrete. The facing of the soffit of the arch is made of 1 part of cement and 2 parts of white marble dust that would pass a ¼-in. screen. The remaining surfaces are faced with a mortar made up of 1 part cement, 1 part trap rock screenings which passed a ¼-in. screen and 2 parts white marble dust of the same size. The trap rock screenings were omitted from the facing of the soffit in order to impart a lighter color to it, thus reducing the darkness beneath the arch. The forms for the concrete of all exposed surfaces consisted of dressed 2-in. tongue-and-groove plank, carefully built to dimensions and heavily braced in position. Their surfaces against which the concrete was laid were given a coat of heavy crude vaseline to prevent any of the facing mortar adhering to them, vaseline being used instead of crude oil to avoid discoloration of the surface. The facing on the soffit was laid just ahead of the lower layer of concrete in the arch ring, while that on the vertical surfaces was laid in flat U-shaped, sheet-iron forms, placed with their concave sides out and their ends against the timber forms. These iron forms were in sections about 4 ft. long and were provided with handles at the top, by which they could be raised. The mortar was kept slightly higher in them than the height of the concrete, and they were raised as each layer of concrete was laid, and the concrete thoroughly tamped along them to form a good bond between it and the mortar.


Arrangement of the Contractor's Plant at the Park Avenue Bridge.



Detail of Steel Arch Ribs and Cross Section at the Crown of the Arch, Park Avenue Bridge.

The facing mortar was comparatively smooth as it came from the forms, due to the surplus cement which had flushed to the surface, but all the exposed surfaces were tooled with toothing chisels after the forms had been removed to make them resemble cut stone as nearly as possible. The cement, trap rock and marble screenings mortar facing has about the color and appearance of Indiana limestone. The facing of the soffit is considerably lighter in color, although the difference in appearance is apparent only where the two shades are brought in direct contrast. The tooling of the surfaces was done by regular stone masons and cost from 7 to 10 cents per square yard, depending on the location.

The construction of the bridge was carried on with little difficulty, the traffic being carried on the old highway pending the completion of the work. The foundation of the abutments and wing walls is a firm hardpan which was uncovered at a depth of a few feet. The abutments were built as soon as the excavation was completed, the arch centering being erected at the same time. The concrete in the abutments was laid in 6 to 8-in. layers, with the top of the layers as nearly perpendicular as possible to the lines of thrust from the arch. As soon as the abutments had reached a sufficient height the steel-truss ribs were put in position, then the concrete of the arch ring was laid and the abutments completed, followed by the erection of the spandrel and wing walls. The centering was made up of rows of 12x12-in. timbers, most of which were set on piles driven to refusal and the whole falsework thoroughly cross-braced.

The concrete mixer was set on the transverse center line of the arch, between the site of the bridge and the old road, at about 12 ft. below the level of the latter. The concrete materials were hauled to the bridge in wagons and dumped at the side of the road, from which they could be shoveled easily on the charging platform of the mixer. The mixer discharged into the boot of a bucket elevator set in a vertical framework built directly against the side of the arch to a height of about 15 ft. above the spandrel wall. This elevator discharged into two hoppers with chutes at the bottom through which wheelbarrows on temporary platforms leading to the different parts of the bridge could be filled conveniently. In the accompanying view showing the arrangement of this plant the mixer is covered and the photograph having been taken from the old highway location does not show the lower portion of the bridge.

The concreting of the arch was carried on in transverse sections from 15 to 20 ft. wide, each section being built in a single day. A section 20 ft. wide at the crown of the arch was first laid and then sections at either end against the skewbacks, followed by the alternate laying of sections on each side from the haunches toward the center. Where the adjacent sections joined, the concrete in the section laid first was cleaned of loose material, wetted and then slushed with neat cement grout before the new concrete was laid against it. When the arch and spandrel walls were finished the top surface of the arch and the abutments and the inner surface of the spandrel walls were given a heavy coat of neat

Portland cement grout. This coating was covered with two layers of tarred paper laid in hot coal tar pitch, with joints lapped 6 in. and thoroughly cemented with the pitch. A 1/8-in. layer of pitch was then applied over the entire surface of the tar paper to make the waterproofing more impervious.

The dense red clay from the excavation for the abutments and wing walls was used for spandrel filling, being hauled to place in wagons and laid in layers about 1 ft. thick. The roadway over the bridge is to be paved with macadam, with concrete sidewalks on each side. The drainage from the roadway is carried directly into the drainage system of the park.

The Park Ave. bridge contains about 6,200 cu. yd. of concrete, 106 tons of steel ribs, 18 tons of Thacher reinforcing bars and required 2,016 sq. yd. of mortar facing on its exposed faces. It cost $84,000 completed, including all excavation, but exclusive of the roadway pavement and sidewalks. Work was commenced on it Aug. 20, 1904, and the concrete work was finished Nov. 22, following. The centering was struck Jan. 9 and 10; the first day the striking blocks were moved enough to lower the centering about 1/4 in. all around, and the second day they were entirely removed. Accurate measurements were made at 10 points on the bridge to determine the amount of deflection due to striking the centers. These showed the maximum deflection to be 0.083 ft. at the crown several days after the centers were struck, with uniformly decreasing deflections toward the skewbacks.

The Bloomfield Ave. bridge was designed for practically the same load conditions that govern the design of the one on Park Ave., with the additional load due to the cars on the electric railroad. The same proportions of concrete were used and the same arrangement of reinforcement was followed in both bridges with additional reinforcing bars under the car tracks in the one on Bloomfield Ave. The artificial stone on this bridge was cast in wooden molds and cut to size when in position, as it was difficult in some cases to cast them to the proper dimensions in these molds. The forms were dressed 2-in. tongue-and-groove plank, painted with crude vaseline, and were well braced in position, with a heavy falsework centering for the arch ring.

The construction was carried on in a somewhat different manner from that followed in building the larger bridge. The abutments were both built first, then the steel arch ribs were placed and the concrete laid in the arch ring as in that bridge. Longitudinal sections of the arch ring wide enough to include three or four of the steel ribs were built as continuous work in a day's shift, each section being held in place by parallel timber forms perpendicular to the centering. The outside steel ribs in each section were clamped to the outside ribs in the adjacent sections by 1/4 x 2-in. straps on about 10-ft. centers along both their top and bottom flanges to reinforce the arch ring transversely and prevent the separation of the longitudinal sections. The street traffic and the tracks of the electric line were carried during construction on a heavy temporary timber trestle at one side of the bridge site, the bridge being built on the old alignment. The concrete was mixed in a continuous mixer at one end of the site and wheeled to different parts of the bridge in wheelbarrows on temporary runways.

This bridge contains 2,745 cu. yd. of concrete, 28 tons of steel ribs and 4.8 tons of Thacher reinforcing rods. Construction work on it was begun June 27 and the concrete laying was finished Nov. 8. The centers were struck Dec. 14, the deflections at the crown of the arch being proportionately as slight as in the Park Ave. bridge.

The bridges were built by the Essex County, N. J., Park Commission, Mr. A. M. Reynolds, Jr., engineer; Mr. H. Rosenstreter, assistant engineer, after the designs of the Concrete-Steel Engineering Co., of New York, that company also acting in a consulting capacity during the work. The architectural features were designed by Messrs. Babb, Cook & Willard, of New York. The contract work on the Park Ave. bridge was done by the Eastern Construction Co., of New Jersey, Mr. T. M. McLeod, superintendent; that on the Bloomfield Ave. bridge was done by Schillinger Bros. Co., of Chicago, Mr. W. A. Hoyt, superintendent.

Rectification of the Erie R. R. in New York.

The Erie R. R. awarded a contract last week to Messrs. Bennett & Talbot, of Greenburg, Pa., for the construction of 12 miles of new double track on its main line, which will be the beginning of extensive and important grade reduction improvements on the New York and other divisions of that road that are to be undertaken in the next 18 months. The improvements are to be made essentially to increase the freight handling facilities of the road and the present intention is to use the new tracks largely for that traffic. The work covered by the contract that has been awarded extends from Guymard to Howells, and will require the expenditure of approximately $1,500,000 to complete. It is a portion of a forty-mile improvement between Guymard and Highland Mills, N. Y., on which in the neighborhood of $7,000,000 are to be spent, and comprises the heaviest work in that length of the line.

The Derrick Placing a Lattice Girder, McIntyre Creek Bridge.

The new tracks follow along somewhat the same route as the present tracks, although in places the proposed line is nearly a mile from the existing one. The new eastbound track is to have a ruling grade of 0.2 per cent. and the westbound track a ruling grade of 0.6 per cent., which are in proportion to the balance of traffic on this division. When the proposed improvements are completed these same grades will rule on the freight tracks of the New York division, which extends from Jersey City to Port Jervis, N. Y., with the exception of a short helper grade out of Port Jervis, eastbound. The ruling grades on this division are now 0.6 per cent. eastbound and 1.3 per cent. westbound, with 18 miles of helper grade which has a maximum of 1.5 per cent.

The tracks ascend gradually without any unusually heavy work from an elevation of 650 at Howells to 740 at Otisville, which is about midway on the work that is to be undertaken immediately. At this point a tunnel 5,300 ft. long will be driven, and from its west portal to Guymard the grading work will be practically the same as it is east from the tunnel, embodying a number of short heavy cuts and high fills. The tunnel will carry two tracks and be 30 ft. wide in the clear to the top of the vertical side-walls at 10 ft. above sub-grade. The arch has a radius of 15 ft., giving a clearance along the center line of 23 ft. over the top of rail, which is 2 ft. above sub-grade. Work is to be carried on from four headings simultaneously, one at each end and two which will begin at a shaft near the middle of the tunnel, the shaft to be 14 x 16 ft. in the clear and about 150 ft. deep. The tracks are to be laid with 90-lb. rails on rock ballast and the whole line is to be first class in every respect. The contract requires the work to be completed in 18 months.

The Effect of Steam Jacketing.

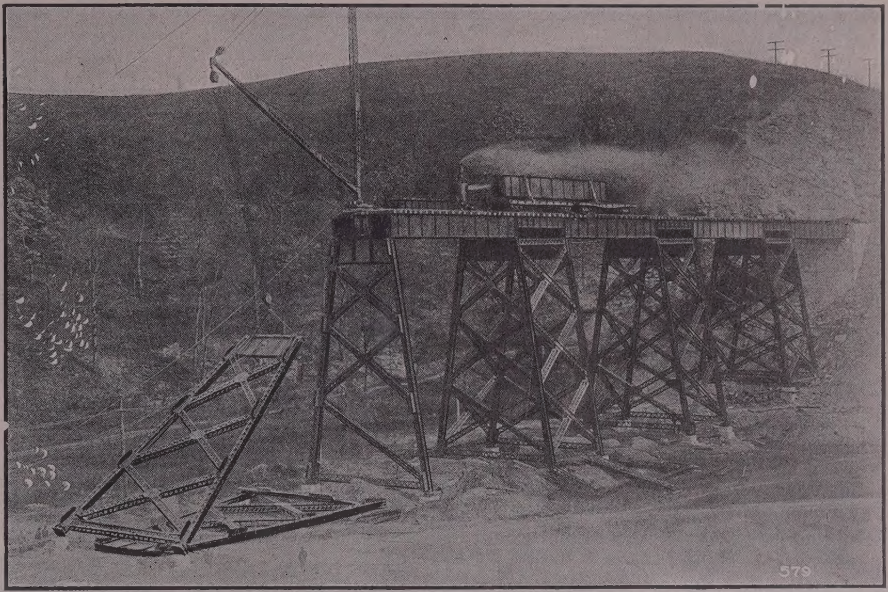
The effect of steam jacketing on the efficiency of an experimental horizontal compound steam engine has been investigated at the Manchester School of Technology by Prof. A. L. Mellanby, who draws the following conclusions from the results: 1, Compound engines with a boiler pressure of 150 lb. may be worked with a mean pressure of about 40 lb., referred to the low-pressure cylinder, without loss of efficiency in terms of the brake horse-power. 2, Jackets have their maximum efficiency when the whole of the high-pressure and the ends of the low-pressure cylinders are jacketed with high-pressure steam. 3, When the jackets are applied to the high-pressure cylinder the total indicated horse-power is slightly reduced, but when applied to the low-pressure cylinder the total indicated horse-power is considerably increased. 4, The jackets have little effect in the high-pressure cylinder, but have a considerable effect in the low-pressure cylinder, upon initial condensation. 5, The temperature cycle of the cylinder walls next to the steam must be considerably less than that of the steam, because the actual "missing quantity" is much less than it would have been had the steam and metal gone through the same temperature changes, and because the mean temperature of the metal is higher than that of the steam. 6, The greater part of the "missing quantity" must be due to leakage and not to initial condensation. The tests were described in a paper at the Liege meeting of the Institution of Mechanical Engineers and aroused much controversy.

The McIntyre Creek Viaduct

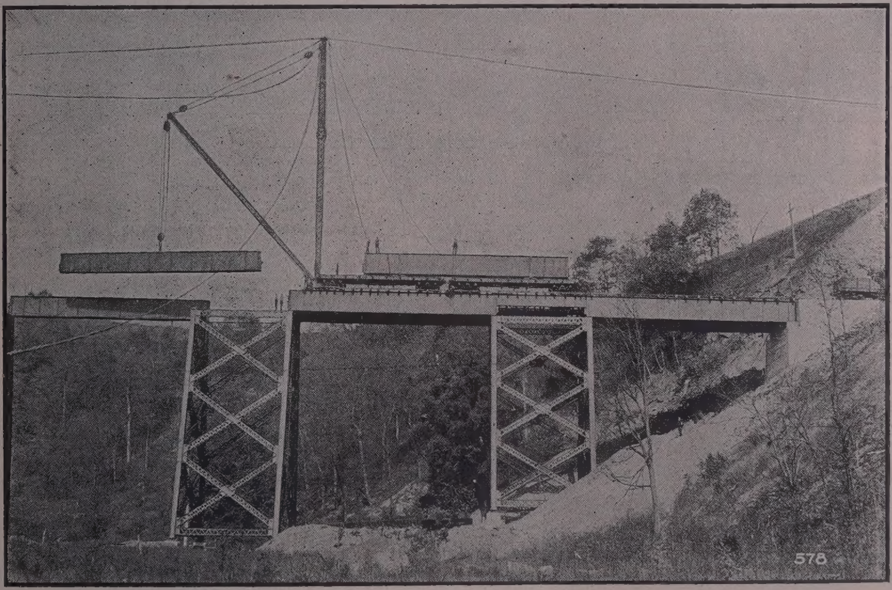
The double track viaduct, A-4698, on the line of the Pittsburg, Toledo & Western Railroad, across McIntyre Creek, in Jefferson Co., Ohio, is about 700 ft. long, 80 ft. high and consists, commencing at the east end, of five 64-ft. deck plate girder spans, five 30-ft. deck plate girder tower spans supported by a concrete abutment, five 30-ft. steel towers, and two 100-ft. deck riveted lattice spans, one 30-ft. tower span intermediately supported by the last 30-ft. tower and one 30-ft. tower between the two 100-ft. spans, and a concrete abutment at the west end.

The plate girders are 3½ ft. and 6½ ft. deep for the 30-ft. and 60-ft. spans, respectively, and the trusses are 10 ft. deep on centers. The towers are each made with two vertical transverse bents cross-braced longitudinally. Their battered columns are in single lengths connected by top transverse plate girders on which the four lines of 6½-ft. longitudinal girders are seated. The 30-ft. longitudinal tower girders are connected by brackets with the end stiffeners of the 64-ft. girders and with the end posts of the 100-ft. lattice girders. The total weight of steel is approximately 970 tons.

The material was delivered by rail at the east end of the viaduct, the 100-ft. lattice girders having been riveted up complete at the bridge shop. A 20-ton steel guyed derrick with a 70-ft. boom and 85 ft. mast was seated on a special foot block mounted on rollers, permitting motion longitudinally, and the structure was first located on the east abutment. By it the first bent of the first tower was assembled on the ground flat ways in the axis of the viaduct, tripped up and set on its anchor bolts. The first span of 66-ft. girders were put in place and their connections bolted and the derrick was moved on them to the tower. During the movement the special foot block before mentioned was rolled on a 4-in. longitudinal plank laid on the regular viaduct deck and was anchored by steamboat ratchets, one from each of the four corners to clamps on the outside girder flanges.



The Bents Assembled on the Ground.



The Derrick Placing a Plate Girder.

The derrick mast was guyed by long ropes fastened to dead men far enough away to permit movement of derrick by taking up and paying out the guys and requiring only one movement of the dead men fastenings. The second bent of the first tower was assembled flatways on the ground with its top toward the west end of the structure and its foot resting on its pedastals, and the first bent of the second tower was similiarly assembled on top of it in reversed position; that is, with its top toward the east end of the viaduct. With the 20-ton derrick the first bent of the second tower and the second bent of the first tower were tripped up and set on their anchor bolts and the bracing of the first tower completely assembled. Then the 64-ft. girders were run out to the front on the cars on which they were shipped from the shop. The derrick boom was revolved under the guys, picked the girders off the cars, launched them ahead and set them in place and similarly the 30-ft. tower girders. Then the deck was put on and the derrick again moved to the front.

These operations were repeated until the structure was erected up to the 100-ft. lattice spans, where the tower between the two 100-ft. spans was too far off for its bents to be assembled and tripped by the derrick. Therefore, the second bent of the tower at the east end of the first 100-ft. span was set from the end of the easternly adjacent 64-ft. span, the bracing assembled and the 30-ft. tower girders were supported on their regular shelf angles at the east end, and at the west end were set 3 in. high on a temporary bent across the top of the tower, so placed as to permit the 100-ft. span to be set. The derrick was moved to the end of the 30-ft. span, and the first bent of the tower at the west end of the 100-ft. span was assembled on the ground and with the derrick and a tripping tackle was revolved vertical and set on its anchor bolts. Then the 100-ft. trusses were run out to the front, launched ahead and set with the derrick and the operations repeated for the next 100-ft. span, which completed the structure.

The working force on the job was nine men and an engineman in the raising gang, and twenty-three riveters and roustabouts. It took one hour to move the derrick ahead and fasten it, and thirty minutes to unload and set a girder after cars were run out to the front under the derrick. Trains were passed over the structure in twenty-three working days after the erection was started.

The viaduct was designed by Boller & Hodge, consulting engineers, New York, and the steelwork was built at the Ambridge plant of the American Bridge Company of New Jersey, Mr. Paul L. Wolfel, chief engineer, and was erected by the American Bridge Company of New York, Mr. S. P. Mitchell chief engineer.

A Steel Highway.

A steel highway is to be laid on a half mile of country road running from Louisville toward Bardstown, Ky., by the Steel Track Highway Co., of Pittsburg. The road where the rails will be laid is now in good condition and there has been some opposition to tearing it up for the purpose of installing an experimental tramway. It may be stated as a general proposition that rails for teaming are not worth much. The money they cost can be used to better advantage in legitimate road improvement. Where there is continuous heavy teaming from quarries and the like it may possibly be advisable to construct such tramways. For all ordinary purposes, however, a King drag properly used will keep a dirt road in good enough condition, and if anything better is needed the only satisfactory solution will be gravel and broken stone construction. A tramway in an ordinary road will ruin it complete in a short time, while a well dragged road will answer any moderate transportation requirements.

PATENTABLE IDEAS were developed to the number of 1412 at the works of the General Electric Company last year by the various departments engaged in experimental work. Of these 615 were carried to such a stage of development that applications were made for patents covering them.

Generating System of the Portland General Electric Co.

In The Engineering Record of Aug. 5 there was printed a brief article concerning the works of the Portland General Electric Co. A much more complete description was read on June 29 before the Engineering Congress at the Lewis & Clark Exposition by Mr. F. G. Sykes, superintendent of the company. He pointed out, at the outset, some features in which the system differs from others of the same general class and explained the reasons for these differences.

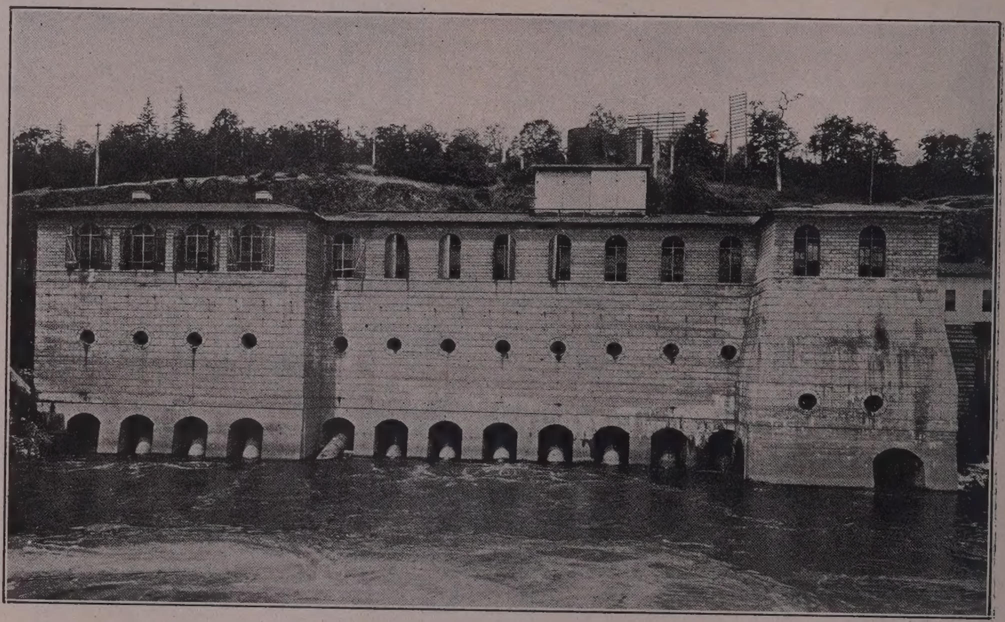
As it is probable that most of my listeners will find opportunity to visit the various stations and sub-stations of our company, before the close of this congress, it is not the purpose here to enter into a lengthy description of the details of our stations, but rather to confine this paper to a general description of our generating and distributing system, leaving further investigation to the individual members themselves, should they so desire.

About 1889 the Willamette Falls Electric Co. built a wooden station on the east side of the Willamette River, at Oregon City, close by the Falls, and installed six Westinghouse 80-k.w., 125-cycle, 3,000-volt, and two Thomson-Houston 120-k.w., 125-cycle, 2,000-volt generators, which were run by Victor turbines. The voltage of the Thomson-Houston machines was stepped up from 2,000 to 4,000 volts by transformers, and the power transmitted to Portland on the east side of the river, while the power from the Westinghouse generators was transmitted at 3,000 volts to Portland on the west side of the river. In order to furnish this power at Portland, a distance of 15 miles, to be used for incandescent lighting, eight single-phase circuits were run, or one circuit for each generator, one of these circuits being on the east side of the river and seven on the west side. Eleven Excelsior arc machines were also installed in the station at Oregon City, and three arc circuits were completed between Portland and Oregon City on the east side and eight on the west side, a circuit being provided for each arc machine. Sub-stations were provided in Portland, both on the east and west side of the Willamette River, to accommodate transformers for changing the voltage from 3,000 to 1,000, which was the voltage used for distribution in Portland on the west side, and from 4,000 to 2,000 volts for distribution on the east side of the Willamette.

Mr. Sykes believes that this system inaugurated the first long-distance transmission in this country, and the Westinghouse generators were the highest voltage machines to be built at that time. In 1894, the electric railway system in Portland was built, and it was necessary to furnish power for its operation. Four sections of the present Station B were built on the west side of the Willamette Falls at Oregon City, and two 400-k.w. rotary-converters were located in the basement under the present offices in Portland. In order to obtain three-phase circuits to operate the rotary converters, and more copper to take care of the increased load, the arc machines were brought to Portland, direct-connected to motors and arranged to operate at 500 volts, direct-current, from the rotary-converters. The arc circuits between Oregon City and Portland were arranged in groups of three wires each, to opeate the three-phase circuits, a separate circuit being provided for each machine practically as they are today, thus making each machine at Oregon City, each three-phase circuit, and each rotary converter at Portland one separate unit.

When Station B was built it was decided to change the frequency from 125 cycles to 33 cycles, in order that arc and incandescent lamps might be operated from the same frequency as that used in operating the rotary-converters. Sixty-cycle rotary-converters at that time were not successful, and it was hoped that low frequency arc lamps would be developed and a compromise frequency adopted.

The Portland General Electric Co. furnishes power for lighting the city of Portland, St. Johns, Oregon City, and suburbs, for operating the railway of the Portland Consolidated Co., and the Oregon Water Power & Railway Co., and also for operating the Portland Flouring Mills and for other manufacturing purposes, near at hand. The generated current is three-phase, 33-cycles, 10,000-volts, and can be furnished either from the water power plant at Oregon City, known as Station B, or from the steam station, located in Portland, known as Station E. This power is led to Sub-station A in Portland, where part of it is changed by means of static transformers from 10,000 to 2,300 volts, to be used for lighting purposes, and is distributed throughout the city of Portland at this voltage, and at a frequency of 33 cycles, over single-phase circuits. The rest of the current for lighting purposes is transformed by means of motor-generator sets from three-phase, 33-cycle, 10,000-volt to three-phase, 60-cycle, 2,300-volt current, which in turn is distributed throughout the city by means of single-phase circuits.



Station B of the Portland General Electric Co., Oregon City.

Power is furnished to the railway system from Oregon City, and is conducted by means of individual transmission circuits to five 400-kw. rotary converters, and one 1,000-kw. rotary converter at Sub-station A. This power is furnished to the Portland Consolidated Railway Co. at 500 volts at the bus-bars, they providing the necessary feeders for distributing it to their trolley wires.

The power or flour mill circuit at the present time is operated at about 6,000 volts, over a three-phase 33-cycle circuit. It is intended, however, to change this in the near future to operate at 10,000 volts.

Station B.—The first five sections of this power station, with the foundations for seven additional sections and the bulkhead immediately above, were built in the fall and winter of 1893-4; the seven additional sections were completed and foundations for the last two sections built during the fall and winter of 1896-7, and the last two sections completed early in 1903. This building is of concrete, and consists of a series of pier walls, vertical and horizontal arches, connected and reinforced by the use of iron rods built in the concrete, and arranged to form separate chambers or independent sections below the generator room for draft tubes, flume and water-wheel rooms. The first set of arches above the foundations form the floors of the flume and wheel-rooms, and the second set of like arches forms the roof over the flume and wheel rooms and the floor of the generator room, which is of cement.

The generator room is 246 ft. long, 206 ft. of which is 38 ft. wide and 40 ft. is 64 ft. wide. The walls are 17 in. thick, of concrete, and 20 ft. high from floor to roof truss plates, and are strengthened with pilasters every 16 ft.; the room is well lighted and ventilated by twenty-six windows measuring 6 ft. 2 in. by 13 ft. 3 in.

The roof is of timber truss, plank sheathed construction, covered with composition-felt gravel roofing, having wire tower of like construction near central part.

The station is equipped with a 12-ton electric traveling crane, and two 12-ton hand traveling cranes. The electric crane can be used throughout the entire length of the building, except in the end offsets, which are served by the hand cranes. The switchboard and electric controlling apparatus is located in the central portion of the building below the wire tower. The racks to prevent debris getting to the wheels are set at inclination of 1½-in. per foot to facilitate cleaning, and are supported by a steel frame of I and channel beams securely tied together and built into the concrete walls of the station. The forebay or headrace is open and extends along in front of and up to the concrete wall of the station.

The tail race is a natural arm of the river extending to the station, which is built into it. The penstocks are of steel with cast-iron heads and covers, and are connected to the open forebay by short steel cylindrical feed pipes extending through the concrete wall of the power station. Each unit is independent and is equipped with a supply gate, operated by hand power through gearing. The supply gate is provided with large balanced iron wickets, so that it may be closed and the water shut off from the penstock without difficulty, even though the wheel gates could not be closed nor the wheels shut down through accident to their particular gate gearing or from other cause.

The original overflow dam is a timber crib, plank deck, rock filled dam, fitted and secured to bed rock with iron anchor bolts, and has an upstream slope of 2 horizontal to 1 vertical, and a down stream slope of 1 horizontal to 1 vertical. The slopes converge to an apex formed of heavy timber, rounded off. The height of the dam varies from 3 to 20 ft., and its greatest width of base is 30 ft.

The original dam structure, on the west side of the river, and extending to the center of the falls, was built in 1889 and was still in good condition after having passed, without serious injury, through the greatest floods known, when it was replaced last year by a solid concrete dam, made necessary by new works constructed at the falls. The present length of overflow dam is 2,460 ft.

The power station proper, with its bulkhead and open forebay or headrace occupies about 54,000 sq. ft. The storage area directly above and in front of the wheels, considering the open forebay only, is 27,500 sq. ft., and it has a depth of 20 ft. at low water.

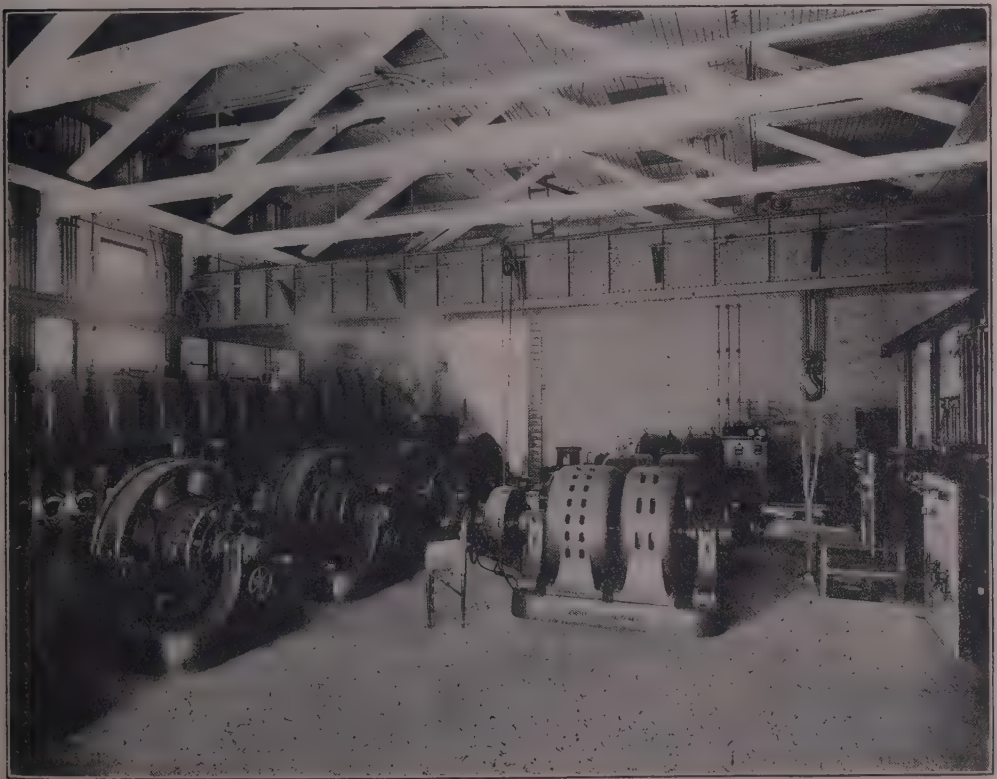
The water supply of the Willamette River above the falls is furnished and maintained by an area estimated at approximately 10,000 square miles.

The water conditions at this station are somewhat peculiar, owing to the fact that the head varies from approximately 40 ft. to 20 ft., at different periods of the year. During the months of May and June, the snows melting from the mountains at the headwaters of the Columbia and Snake rivers, make it back into the Willamette. While the height of the river above the falls does not vary greatly, that below the falls, during these seasons of the year, is very much increased, thus cutting off the head. For this reason, it was necessary to install two separate turbines, one 42 in. and the other 60 in. in diameter. During the months of July, August, September and part of October, the head is very high, but the quantity of water is at its lowest stage. Throughout the rest of the year there is no lack of either water or head.

Dynamo Room in Station B, Portland General Electric Co.

The water wheels are the regular American mixed flow type, and are set above the tail water, using draft tubes of 21 ft. vertical distance between the wheels and the surface of the tailrace at low water, in the sections equipped with vertical settings, and 27 ft. vertical distance between the center of the wheel shaft and the surface of the tail race, at low water, in the sections equipped with horizontal settings.

The main water wheel equipment consists of ten Victor cylinder gate wheels 42 in. in diameter, and ten increased-capacity Victor cylinder-gate wheels 60 in. in diameter, each set on vertical shafts. One wheel of each of the above diameters is installed in each section as one setting, and is arranged to drive a single generator at a fixed speed of 200 r.p.m. at all heads, from 20 to 40 ft. These units are arranged so that they can be operated separately or all together for driving the generator, as the circumstances require, to get the best results and the most economic use of the water. The generator is direct-connected to the 42-in. wheel shafts and the 60-in. wheel is connected to the 42-in. shaft and generator by means of an endless double leather belt 46 in. wide. The tension on this belt is controlled by a belt tightener, arranged to move on track by pinion and rack gearing, and the tightener shaft is supported on ample step and runs in trunnion self-adjustable bearings, all of which are provided with self-lubricating oil baths.



Rotary Converter and Motor Generator Sets in Substation A.

In addition to the above equipment, there are installed two Standard Victor cylinder-gate wheels, each 15 in. in diameter set on horizontal shafts. These sets are used in the pump section for driving the oil and water circulating pumps. There are also provided two Victor cylinder-gate wheels, 42 in. in diameter, each of which is placed in its own vertical shaft, the two wheels, however, being located in one section and arranged to be used at the present time for furnishing power to the electric railroads around Oregon City.

The latest additions to the station are two horizontal sets, each consisting of two New McCormick cylinder-gate wheels 51 in. in diameter, direct-connected on the same shaft to a 540-kw. General Electric generator.

All the vertical wheel shafts mentioned above are provided with ring thrust and oil pressure piston bearings, except the 60-in. wheel shafts, which have only the ring thrust bearings. These bearings are placed in cases, supported from the flume heads on cast-iron columns, and are arranged to carry the weight of the generator, armature or field, as the case may be, and of the pulleys and shafts. No parts of these weights come upon the water wheel steps, as the shafts are separated by the coupling above the water wheel and the connection is made with a heavy pin drive or jaw, as the case may be, the faces of the separate halves of the coupling being ¼-in. apart.

The generators installed in this station are of the following types and capacities: Seven 450-kw., three-phase, 10,000-volt, revolving-armature, 33-cycle generators; three 500-kw., three-phase, 10,000-volt, revolving field, 33-cycle generators; two 540-kw., three-phase, 10,000-volt, revolving-field, 33-cycle generators. One section contains: Two 200-k.w. vertical 500-volt direct-current generators, used either as exciters or street railway generators.

The 540-kw. generators are horizontal and the remainder are vertical. To each of the two horizontal generators is belted an 85-kw., 125-volt exciter. All of the generators are of General Electric make.

Station D.—The apparatus located at Station D, which is part of the old cable power house, belonging to the Portland Railway Co., consists of a 325-kw., 550-volt direct-current railway generator, belted to a small engine. This station has been practically shut down, as power furnished by it is only used at times of extreme heavy load.

Stations C and E.—These stations are located in buildings adjoining one another. Station E is a brick structure with a steel truss roof covered with tar and gravel roofing. The engine room is 46x160 ft., and is separated from the boiler room by a 24-in. curtain wall. The boiler room is 61x148 ft., with an ell at one end, 36x71 ft. The curtain wall is provided with fireproof doors, and there are also fireproof doors in the walls between Stations C and E. Station C is composed of a boiler room 100x40 ft. and an engine room 100x120 ft., all being in a frame structure with galvanized iron siding, wooden truss roof and tar and gravel covering; the engine room is separated from the boiler room by a 10-in. curtain wall of brick.

The stack of Station E is 230 ft. high, of concrete-steel construction, and is 12 ft. in inside diameter. Each battery of boilers in Station C is equipped with an individual steel stack, about 60 ft. high by 3 ft. in diameter.

Station E is equipped with five batteries of Cahall water-tube boilers, manufactured by the Aultman & Taylor Co., each battery having a rating of 1,040-b.h.p., and is built to operate at 175 lb. Three of these batteries are equipped with Foster superheaters, built to superheat the steam to 175° Fahr. Station C has fourteen 100-h.p. horizontal tubular boilers and four 125-h.p. horizontal boilers. These operate at 100 lb. pressure.

In Station E, one end of the boiler room has been reserved for a pump pit, in which are installed three Worthington horizontal centrifugal turbine pumps driven by vertical engines which pump the condenser cooling water from the river through the condensers. Two lines of 33-in. cast-iron pipe are run to the river for this purpose, one for the suction and the other for the discharge. In addition to these pumps three Blake outside-packed plunger pumps are provided for feeding the boilers. The suction of these pumps can be taken either from the discharge of the circulating water, as it comes from the condenser, or directly from the river. Arrangements have been made so that in case either of these two sources of supply should fail, the water can be forced into the boilers from the city main. The plant is also provided with three Goubert feed-water heaters.

All of the steam piping was furnished by M. W. Kellogg & Co., and installed partly by the Willamette Iron & Steel Co. and partly by the Portland General Electric Co. The high-pressure steam piping is made extra heavy of lap-welded mild open hearth steel and Van Stone joints are used. All low-pressure piping, except the free exhaust from the engines outside of the relief valves and the free exhaust from the feed-water heater, are of standard weight wrought-iron pipe, the free exhaust above mentioned being riveted sheet-iron pipe. The piping is so arranged that any part of the plant can be isolated when desired.

The boilers at Station E are arranged so that they can either burn oil or sawdust, and are provided with Dutch ovens, there being two ovens under each boiler, or four ovens per battery. Each oven is provided with two Morrissey oil burners, so arranged, by means of unions in the steam and oil piping, that the burners can be quickly and easily disconnected when it is desired to use sawdust. A storage tank is provided outside of the station and underground of sufficient capacity to hold two and one-half carloads of oil. This oil is pumped to the burners by means of a pressure pump built by the Portland Machinery Co.

The main fuel used in the station, however, is sawdust obtained from the Eastern Lumber Co. and the North Pacific Lumber Co., which are located close to the station. This sawdust is transported to the station by team and dumped into a hopper. From this hopper, by means of a conveyor, it is carried to the fuel house. There the conveyors take the sawdust and carry it to the boilers at either Station C or E, as desired, where it is fed into the top of the Dutch ovens. A remarkably hot fire is thus furnished, at a low cost.

The generating equipment of Station E consists of two 1,400-h.p. marine-type vertical compound engines, built by the Willamette Iron & Steel Wks., of Portland, each of which is direct-connected to a 1,000-kw., 33-cycle, three-phase General Electric alternator; one Ideal engine exciter of 85-kw. capacity; one motor-generator exciter of 60-kw. capacity, and two Curtis steam turbines, each rated at 1,500-kw., but good for 2,000 kw. continuously.

The condenser system of Station E consists of two Worthington surface condensers, each having 2,300 sq. ft. cooling surface, and two Worthington surface condensers having 7,800 sq. ft. cooling surface, the latter being used for the Curtis turbines. These condensers are provided with air coolers and hot wells, and with the necessary dry vacuum and hot well pumps. The turbines are also provided with two outside packed plunger pumps for forcing the water into the step bearing at a pressure of 450 lb. per square inch. An accumulator is used in connection with these pumps.

The oiling system for the engines consists of White Star oil filters, and for the turbines of two tanks, one placed near the roof and the other in the basement, the oil being pumped into the tank near the roof by means of small plunger pumps and allowed to run through the turbine bearings by gravity.

The piping arrangements are such that the water from the condenser hot well can be used for the end step bearings of the turbines, the surplus water not used for these being fed through the heaters back to the boilers.

The generating equipment of Station C consists of: One double Wheelock engine of 1,600-h.p. capacity at 100 lb. pressure, connected with rope drive to one 800-kw., 550-volt generator; one Allis cross-compound engine of 1,000-h.p. capacity connected by rope drive to one 750-kw., 10,000-volt, 33-cycle alternator; one 400-kw. and one 200-kw. General Electric street railway generator set, built to furnish 550 volts, and each direct-connected to Fulton engines.

In Station C the Wheelock engine and the vertical railway sets operate non-condensing, while the cross-compound Allis engine running the 750-kw. machine is provided with a jet condenser.

Sub-Station A.—The sub-station, together with the office, is a one-story brick structure, divided into two parts. One is 60x100 ft. and contains the rotary-converter and motor-generator sets; the other contains the arc machines in the basement, with the general offices located above.

The rotary-converter equipment of the sub-station consists of five 400-kw., 550-volt, and one 1,000-kw., 550-volt rotary converter, all made by the General Electric Co. An additional 1,000-kw. rotary converter will be installed very soon. These rotaries are each provided with three suitable air blast transformers, stepping down from 10,000 to 375 volts, and each has an alternating-current panel and corresponding direct-current panel at the switchboard.

General View of Willamette Falls at Oregon City.

The motor-generator equipment of the sub-station consists of two 500-kw. and one 1,000 kw., 10,000-volt, 33-cycle synchronous motors, direct-connected to 2,300-volt, 60-cycle generators, each provided with a 125-volt, 50-kw. (60-kw. in the case of the 1,000-kw. motor-generator set), combined starter and exciter, mounted on the end of the same shaft.

An Underflow Water Development of large size is proposed by the Camas Irrigation & Power Co., of Idaho. A hydraulic power plant costing $534,000 is to be constructed on the South Boise River at Pine, from which a system of transmission and telephone lines 118 miles long will be run to a tract of 160,860 acres. This land is underlaid by a water-bearing stratum within 5 to 7 ft. of the surface and extending in places to a depth of 150 ft. It is proposed to build 281 well pumping stations on the tract, each having electrically driven centrifugal pumps and a 20x80-ft. storage basin 15 ft. deep. These stations are estimated at $4,000 each. State Engineer Stephenson reports that, from all indications, the water-bearing gravel should carry a sufficient flow for the proper irrigation of the entire tract, yet practical demonstration of the capacity of the basin can alone determine its ability to furnish the 5,000 cu. ft. of subterranean water the company has appropriated.

Steelwork of the New General Electric Machine Shop.—I.

The new 800x147-ft. steel-frame machine shop for the General Electric Co. at Schenectady represents the best construction and latest features for buildings of this class. It contains a large number of special and standard machine tools ranging from very heavy and powerful ones to light, high-speed machines intended for finishing work; these are driven either by independent electric motors, or, in the case of the lightest machines, are arranged in groups driven by a single motor.

The building has a total height of about 80 ft., and is enclosed with brick walls, with about 70 per cent of their area glazed, with windows arranged in three tiers. It is divided into two main aisles by an intermediate row of longitudinal columns, which, with the wall columns, support roof trusses of about 76 and 69-ft. span. The 76-ft. aisle is one story in height and is used for an erecting shop and for some of the larger machine tools, which are arranged in the center of the floor and served by two sets of girder cranes traveling the full length of the building. The lower runway has one 50 and one 30-ton crane of 72-ft. span and a height of 34½ ft. from the floor to the top of the rail. The upper system has also one 50-ton and one 30-ton crane, with spans of 75 ft. and a clearance of 52 ft.

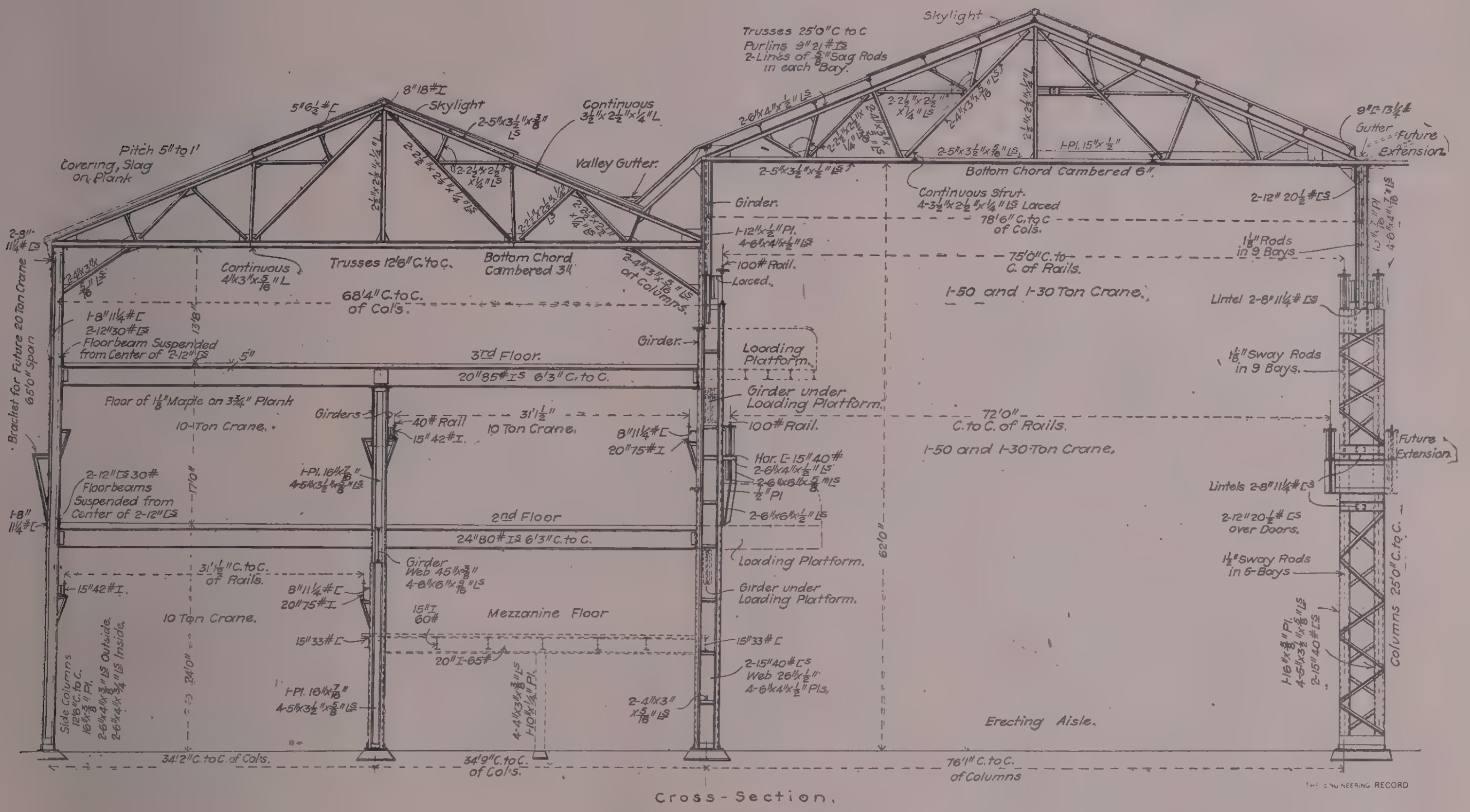
The 69-ft. aisle is devoted to smaller machine tools, brass-working, some of the stages of electrical apparatus construction, and the storage of materials. The shop offices and toilet rooms are also located here. The aisle is divided approximately in the center by a longitudinal row of columns which carry the second and third stories as well as a mezzanine story between the first and second floors. This mezzanine covers about one-half of the area of the side aisle and adjoins the outside. All of these stories communicate freely with the single-story erecting shop through the unenclosed spaces between the center row of columns. In several places the cantilevers of the extensions of the second and third-story transverse floor girders project 10 ft. into the erecting shop, so as to provide loading platforms on which transfers can be made to and from the traveling cranes. The mezzanine story and part of the first story of this aisle which is below it, is not equipped with traveling cranes, but the remainder of the aisle has three systems of 10-ton traveling cranes of 31½-ft. span, which cover all the floor space. The upper story in this aisle has no traveling cranes.

The building is lighted through the side walls and through wide skylights on each side of the peaks of the double-pitched roofs, which serve to give abundant illumination throughout the entire area of the shop. The skylights, of "Translucent Fabric," are fixed and occupy a total area of about 40 per cent. of the roof surface. The lower floor is of concrete and the upper floors are all of 5-in. plank, supported on the top flanges of the beams and girders, which are proportioned for uniformly distributed live loads of 225 lb. per square foot. The roof is of slag composition on sheathing boards parallel to the top chords of the roof trusses. It is proportioned for a live load of 45 lb. per square foot. The shops are heated by a Sturtevant hot-air blast plant near each end of the building and are ventilated by tubular ventilators in the roof, and have both arc and incandescent lamps. As there is comparatively little combustible material in the building, it was not considered necessary to fireproof the structural steelwork, but protection against possible fire is provided by fire screens made by covering the entire elevation of the roof trusses with corrugated iron. These form six partitions, about 125 ft. apart, extending entirely across the building. A similar partition 12 ft. high extends through the building in the plane of the intermediate longitudinal columns, connecting their upper ends and leaving the space below them open.

Framing.—The framework consists of 32 transverse bents, 25 ft. apart, connected by longitudinal members and diagonal braces. Each bent consists, as indicated in the general cross-section, of three main columns carrying the floor and runway girders and the roof trusses. In the three-story aisle there is another full row of columns and a partial row of short columns under the mezzanine floor. In the east or three-story aisle an intermediate wall column is provided in the center of each panel.

These columns and those in the intermediate and center row are capped by longitudinal plate girders, which support transverse I-beams 6 ft. 3 in. apart in both second and third floors. These beams are regular except in four panels at the ends and near the quarter points of the building, where special framing is provided for elevators in the outside sub-aisle and for two places in the floor, where longer beams cantilever into the erecting shop to provide the loading platforms. The second-floor beams are not braced excepting in the end panels, where there are diagonal angles, as indicated in the diagram. In the third floor the beams are braced by twelve panels of angles like those indicated in the part plan. At the level of both second and third floors horizontal trusses are carried across the full width of the building at each end to reist the wind pressure on the gable walls. The inner chords of these trusses are supported by vertical trusses, which serve also to carry foot bridges across the building.

The mezzanine floor occupies about 50 per cent of the area of one-half of the three-story aisle, and its floors are supported on longitudinal stringers carried by transverse I-beams supported by the main columns and by an intermediate row of one-story columns on the center line. The longitudinal panels in the walls are regular except that in five cases on the east side of the building one column is made special and is seated on a plate girder at second-floor level, which is carried by the adjacent columns so as to leave an opening of 25-ft. span for the rolling doors. The columns are braced by 1½-in. clevis rods in double panels next to the ends and at three intermediate places, as shown in the diagram. The roof trusses are braced longitudinally by the purlins and by diagonal 1⅛-in. square clevis-end rods in the planes of the top and bottom chords in alternate panels.



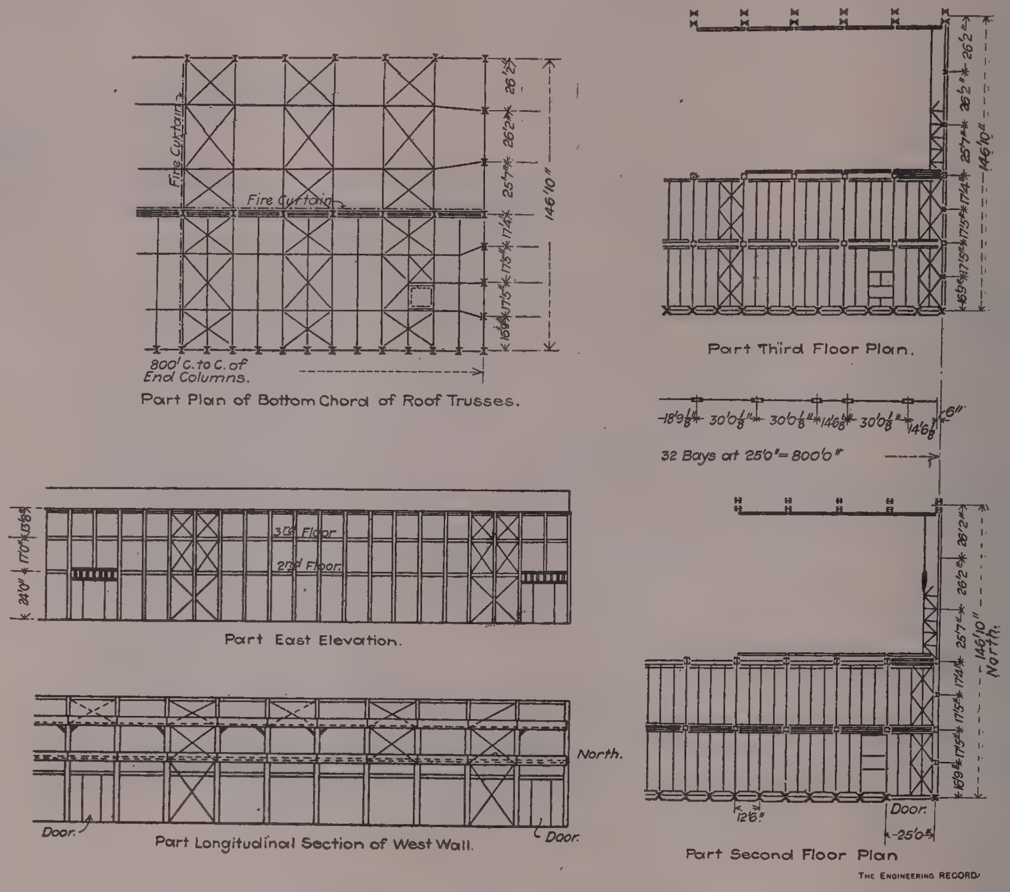
General Design of Regular Transverse Bent of Steel Framework.

Columns.—All of the columns have rectangular battered concrete piers carried down to footings on hard sand or gravel. Their dimensions vary with the loads imposed, the heaviest being 1,026,000 lb., for which a pier is provided nearly 6x7 ft. on top. The upper surfaces of the piers are uniformly 18 in. below the floor line and receive the cast-iron bases for the columns. These are secured to the pier by four 1½-in. round bars, which are anchor-bolted to reaction bars built into the base of the pier.

The floor columns are made in single two-story lengths with I-shaped cross-sections, having 16-in. web plates and pairs of 5x3½-in. flange angles. Below the second floor line the flanges are reinforced by 15-in. channels, which receive the additional load of the crane-girder runways. Brackets are riveted to the column flanges to receive the runway I-beams, and reinforced shelf angles and web connections are provided, as indicated in the drawing of the typical column, beam and girder connections. At the upper ends the columns have wide connection plates shop riveted across their flanges to receive the field-riveted connections of 25-ft. longitudinal lattice girders carrying the intermediate floor beams.

The one-story intermediate columns supporting the mezzanine floor are about 12 ft. long and are made with 10x¼-in. web plate and 4x4x⅜-in. flange angles and have cap and base plates for their footings and to receive the floor beams. The columns in the gable ends of the building have rectangular cross-sections made with pairs of 12-in. channels latticed. The horizontal framing consists chiefly of channels with their flanges supported on horizontal brackets and shelf angles riveted across the column flanges. In some cases the columns are made with cross-sections having 12x5/16-in. cover plates.

(To be continued.)



Part Plan of Bottom Chord of Roof Trusses. Part Third Floor Plan. Part East Elevation. Part Longitudinal Section of West Wall. Part Second Floor Plan

Diagrams of Framework, General Electric Machine Shop.

The Early History of the Lake Superior Iron Mines.

The recent celebration of the fiftieth anniversary of the Soo Canal naturally calls attention to the wonderful iron ore traffic of the Great Lakes, one of the most important freight movements in the world. It became possible through this canal, and its early history is one of the most interesting chapters in our industrial development. It has been largely a matter of tradition until now, but is at last put on record in a book entitled "The Hon. Peter White," by Mr. Ralph D. Williams, editor of the Marine Review, of Cleveland. The information has been laboriously extracted from the records of the old ore companies, and forms a story of hard work, high aims, heavy responsibilities and sometimes of the pitiful collapse of ventures of seeming promise at the outset.

The industrial supremacy of the United States in the manufacture of iron and steel, the output of which will probably exceed during the present year the combined outputs of Great Britain, Germany and France, is due largely to the purity, abundance and cheapness of transportation of the ores of the Lake Superior country. The premier position which the United States now holds rests upon a very firm basis for not for many years will these deposits be exhausted; nor indeed could they be sensibly affected in value were equally enormous deposits discovered elsewhere; since in journeying to the furnaces they travel along a highway whose economy of transportation is not equalled anywhere in the world. So enormous has the ore trade of the Lake Superior country grown that it seems incredible that it should be a matter of the past fifty years merely. Yet fifty years ago the rapids of the St. Marys River, acted as an insuperable barrier to commerce with Lake Superior. This great ore trade is now handled with such ridiculous ease and with equipment in the shape of ships and docks that can readily adapt itself to fluctuations from one to five million tons per month, that a truthful recital of the time when an annual stock pile of 1,000 tons at upper lake ports was considered a goodly amount, becomes extremely interesting.

In examining the early manuscripts and collateral data for his history, Mr. Williams discovered considerable information concerning the early copper discoveries and this information, for the sake of history, has been incorporated, in the prologue. Iron, however, is the book's serious subject. It has been considered just to tell the story of the beginnings of the Lake Superior iron industry under the title which has been given to it. Peter White, now the leading citizen of the Upper Peninsula of Michigan, assisted, as a boy, in stripping the first iron mine. He wrote the bill of lading of one of the earliest, if not the first shipment of ore, only six barrels, and although nearly sixty years have gone by since then, he is still active in this great iron region.

Iron ore was first discovered in the Upper Peninsula by Wm. A. Burt, United States deputy surveyor, who was engaged in surveying the Upper Peninsula. He was the inventor of the solar compass, and the presence of the mineral deposits was discovered by the violent fluctuations of the needle. Mr. Burt was greatly perturbed by these fluctuations and commanded the members of his party to search about to see what they could discover. They had no trouble whatever in discovering ore, for a mere rip of the sod revealed the mineral. The surveyors appeared to have made no effort to profit by their discovery, merely recording the findings in their field notes. They mentioned the existence of iron to Louis Nolan, a half-breed, living at Sault Ste. Marie, Mich., and an Indian chief, Madjigijig, whose wigwam was at the mouth of the Carp River. A year or two prior to this time the Upper Peninsula was literally overrun with prospectors searching for copper and other precious metals. No one had hitherto heard of iron. In the spring of 1845, P. M. Everett, of Jackson, Mich., accompanied by four men, reached Sault Ste. Marie enroute to the copper country. He met Louis Nolan at Sault Ste. Marie, who related to him the discovery of the iron deposits by the surveyors and volunteered to show him the ore. Everett had not heard of iron, but accepted the offer of Nolan and employed him as a guide. Nolan took the party as far as Teal Lake, but was unable to locate the deposits. Everett then started for Copper Harbor, but fortunately fell in with Madjigijig to whom he related his fruitless search, and Madjigijig immediately offered to conduct him to the deposits. The old Indian's superstitition was so great, however, that he would not approach the deposits directly, but merely pointed them out from a distance. He showed him the Jackson mine and the Cleveland mines. These two terms are used because it was by these names that the mines later became known. The actual discovery of the Jackson deposits was made by two members of Everett's party, S. T. Carr and E. S. Rockwell. The party had a number of permits in their possession, issued by the Secretary of War, to pre-empt mineral locations, one of these made out to James Ganson was used on the Jackson location. The party then gathered up a little of the ore and returned to Jackson, Mich., with it.

The following spring another expedition was fitted out by the Everett party to visit the Jackson location. They built a house upon it and returned to the mouth of the Carp River with 300 lb. of ore on their backs. A few of them remained behind to hold possession, but one named Berry journeyed on to the Sault with the ore. At the Sault, Berry met Dr. J. Lang Cassels, of Cleveland, who had been sent into the peninsula by a number of Cleveland gentlemen. Upon agreement to bear jointly the expense of making roads, Berry directed Dr. Cassels to the Cleveland location and Cassels caused it to be preempted. These two mines subsequently yielded millions of tons of ore.

Berry proceeded to Jackson, Mich., with his ore, where he made two attempts to smelt it in a cupola furnace but failed. Some of the ore was then taken to Mr. Olds, of Cucush Prairie, who succeeded in making a fine bar of iron from it in a blacksmith's fire, the first iron ever made from the Lake Superior ore.

In the summer of 1847, the Jackson Co. started a forge on Carp River, three miles from the mine, and on Feb. 10, 1848, the first iron ever made in the Lake Superior region was made in this forge by Ariel N. Barney. A month later the forge went out of commission, being carried away by a freshet. Mr. Everett returned in the spring of 1848 and repaired the dam, and resumed the manufacture of blooms. The first iron made was sold to E. B. Ward, who used it in the walking beam of the steamer Ocean. The forge had four fires, from each of which a lump was taken every six hours, which was placed under the hammer and forged into blooms 4 in. square and 2 ft. long. The daily product was six tons, requiring two teams of six horses each to convey the blooms to Marquette which lay ten miles away. The roads were of unvarying horror and breakdowns were frequent. The same difficulty which attended the getting of the blooms to port attended the getting of supplies to the forge, the ore and charcoal. After struggling with insufficient power, the Carp River running pretty low, with frightful grades and unspeakably bad roads, the forge met the death to which it was born.

Robert Graveraet, who lived at Mackinaw, believed that he had a claim upon the Cleveland location and also on a third deposit which later became known as the Lake Superior mine. In March, 1849, he organized the Marquette Iron Co., composed of W. A. Fisher, A. R. Harlow, E. B. Clark and himself to develop these two mines. Sam H. Moody and John H. Mann were endeavoring to pre-empt the Cleveland location for him and Dr. Edmund C. Rogers the Lake Superior location. Graveraet having organized his company went to Mackinac Island to get men to develop the mines. Peter White, as a boy, was then working with Captain August Canfield, who was building a lighthouse on Waugashance Reef. He went to the iron mines with Graveraet, and has remained there ever since, incidentally molding a town, since Marquette is truly his handiwork. He assisted in stripping the first iron mine and worked faithfully at this occupation for months. In the fall of 1850 all the pre-emptors gathered at the land office at Sault Ste. Marie to prove their claim to the deposits. Sam Moody and Dr. Rogers had left Marquette in a small boat to claim the Cleveland and Lake Superior deposits. They were becalmed and did not reach the Sault on the appointed day. The Cleveland Co. proved its claim to the Cleveland mine without opposition. The Lake Superior was claimed by Isaiah Briggs, who was a packer of provisions for the surveying party and who had established a shanty on the Lake Superior location for himself and pony, utilizing it as a basis of supplies. On the strength of this residence he secured the Lake Superior deposit for John Burt. Burt subsequently gave a half interest in it to Graveraet.

The pioneers of the iron mines were all possessed with the idea that the peninsula was the logical place for making pig iron. They all attempted it, but the obstacles against its successful manufacture were insuperable. One of the causes was the impossibility of keeping sufficient stock of charcoal on hand to keep the forge running. The charcoal in those days was all burned or charred in pits. Such a thing as a charcoal kiln of brick or stone was unknown. Then, again, the hauling to the shore of the lake was expensive and the unloading at the Sault for portage over the rapids was also expensive. By the time the bloom iron had reached Pittsburg it cost $200 per ton to make, while the market price for iron at that time was $70 per ton. It began to dawn on the pioneers that the real business of the peninsula was the shipping of the ore itself to the lower lakes. This operation was also attended with great difficulty. Nothing but an Indian trail extended from the shore of the lake to the mine. The crude wagon road which had been hewed through the forest would not bear so weighty a substance as ore in the summer time. The summer time was, therefore, devoted to mining the ore and the winter to hauling it in sleighs to the shore of the lake. The sleighs held about a ton each, and it was impossible for a team to make more than one trip a day. The records of the Cleveland Iron Mining Co. show that 18 tons were hauled one day, which, added the agent, "is the biggest day yet." If by spring time a stock pile of 1,000 tons had accumulated on dock it was accounted a large amount.

In 1852 the iron companies began the construction of a plank road to the mines. It was at this time that Peter White wrote the bill of lading of one of the earliest shipments of ore of the Lake Superior country. It consisted of six barrels, consigned to B. L. Webb, Detroit, who was at that time secretary of the Jackson Iron Co. The ore was shipped to Sault Ste. Marie on the steamer Baltimore. Prior to this time it was reported that some five tons had gone forward to A. L. Crawford, of Newcastle, Pa.

In the fall of 1853 about 150 tons of iron ore were sent by the Cleveland Iron Mining Co. to the furnaces of the Jackson Iron Co. at Sharon, where it was tested in the blast furnace. It made a superior grade of iron, but it is doubtful if it was smelted successfully, so far as the blast furnace was concerned, as it left the furnace in very bad shape. However, its quality was undoubted, and the iron companies determined to convert the plank road into a strap railroad. Meanwhile construction had begun on the canal at Sault Ste. Marie. Energies were bent to complete the strap railroad before the canal should be opened, but as the railroad was not completed until November, 1855, the canal was actually finished several months ahead of it.

The first shipment of ore through the canal was on the brig Columbia on Aug. 17, 1855, and consisted of 132 tons, shipped by the Cleveland Iron Mining Co., consigned to the Cleveland Iron Mining Co. In point of fact, all the ore that left the peninsula that year, 1,449 tons, was shipped by the Cleveland Iron Mining Co., the other two companies, the Jackson and Lake Superior, not being prepared to ship any ore at all. This old strap railroad led a very strenuous life indeed for two years. All the motive power was mules, and the cars held about four tons each. The mules, however, could make only one trip a day. The grades were simply frightful, and the cars sometimes ran away, mangling the mules and jumping the track at the first curve. Heman B. Ely had begun the construction of a steam railroad to the mines, and when Congress passed the Land Grant Act to stimulate the construction of railways, the iron companies made overtures to consolidate their strap railroad interests with Ely's steam railroad interests, in September, 1857, and the first two locomotives used upon it were named the "Sebastapol" and "C. Donkersley." These two locomotives were the first to be used in the peninsula and were built by the New Jersey Machine & Locomotive Works, at Paterson, N. J. They were capable of hauling 1,200 tons a day, which was termed in the newspapers of the time, "an avalanche of ore."

It is interesting to recall that the furnace men of the early days had great difficulty with Lake Superior ores in the furnace. It must be remembered that the blast furnaces of those days bore little relation to the blast furnaces of to-day. It has been related that about 150 tons of ore were shipped to Sharon by the Cleveland Iron Mining Co. in 1853. It was landed at Erie, Pa., and sent by canal to Sharon. The first boatload was delivered at Sharpsville furnace, owned by David and J. P. Agnew. Describing this event, David Agnew wrote:

"The ore was used in the furnace partly alone and partly in mixture with native ores, and the experiment was highly successful, the furnace working well and producing an increased yield of metal which was taken to the Sharon Iron Works and there converted into bar iron and nails of a very superior quality."

The second boatload was also brought to Sharpsville, but having been intended to be left at the Clay furnace, owned by the Sharon Iron Co., was returned and used at that establishment.

The first pig iron produced in the Lake Superior region was made in 1858 by Stephen R. Gay, who leased the forge of the Collins Iron Co., and converted it in two days at an expense of $2 into a miniature blast furnace. The forge of the Collins Iron Co. was the third to be established in the Lake Superior country, having been built in 1854 by Geo. B. Russell and others. The two which had preceded it were the forges of the Jackson and Marquette Iron companies. The pig iron produced by Mr. Gay, was, of course, purely experimental. The first blast furnace in the Lake Superior region was built by the Lake Superior Iron Co., at what is now the city of Negaunee. It was called the Pioneer furnace. Work upon the furnace was begun in June, 1857, and was finished in February, 1858. Mr. E. C. Hungerford was the agent and Stephen R. Gay superintendent.

The first stack of the Pioneer Iron Co. went into blast in April, 1858, and the second in May, 1859. The annual report issued in September, 1859, stated that besides the capital fully paid in of $125,000, a floating debt of $95,000 had accumulated and that the company was losing money on every ton of iron turned out. The quality of its charcoal iron, however, was above criticism.

A number of other furnaces followed the Pioneer, being located at various points with reference to different advantages for the manufacture of iron, one locating near a belt of hardwood, another near a limestone quarry, a third near an ore deposit, and a fourth to secure the benefit of water privilege. The furnace history of the upper peninsula, however, has been one of general abandonment, the Pioneer being the only one of the early furnaces to have survived. One can wander into the wilder portions of the Marquette range to-day with a feeling that no one has ever penetrated that portion of the wilderness and suddenly come upon the remains of an old charcoal furnace with its battery of ruined kilns, embankments and roadways, mute testimonials of earnest but unrewarded effort.

In Developing Underground Waters it is important to observe any effect of this work on surface streams, for the common law of underground waters differs materially from that of surface streams. In a recent case before the California Supreme Court, 77 Pac. Rep. 1113, it is said: "While owners of land are entitled to drive tunnels therein, and to develop and use percolating waters collected thereby, they are not entitled, as against the owners of water flowing in a stream, to so construct such tunnels as to create a direct draft on the flow of the stream."

Sewage Disposal and the Oyster Industry.

Last June Mr. Geo. W. Fuller read before the Franklin Institute a very complete and lucid exposition of the effect of sewage disposal on the oyster industry, a problem that is rapidly becoming one of deep importance. The author's purpose was not to bring forth any new data, but rather to summarize briefly the more authentic information in the premises now available from various sources, and to point out some lines along which further data are needed before the subject may reach a sound and logical conclusion.

A moment's reflection will show that the most serious aspect of oyster pollution does not relate by any means to outbreaks at large banquets or summer hotels, but rather to the significance which this proposition bears to the various cases of this disease scattered throughout the entire world of oyster-eating people. It is well known that typhoid fever frequently appears among people who, so far as can be ascertained, have not been exposed to infected water, milk or other foods, and which constitute what are generally called sporadic or isolated cases of typhoid fever.

To ascertain even in a general way the relation of various shellfish to these isolated cases is a very difficult and complicated matter. In the recent inquiry conducted in a most careful manner into this general proposition by the Royal Commission of Great Britain on the Disposal of Sewage, a circular letter requesting information upon this subject to thirty-one county councils, drew forth the fact that twenty-one of them had no evidence bearing upon the question. The principal information elicited by these letters from the remainder may be briefly summarized as follows:

Southend-on-Sea, England.—The health officer, Dr. Nash, expressed his opinion, as the result of careful investigation, that at least 50 percent. of the typhoid fever was due to the consumption of shellfish from sources contaminated by sewage.

Yarmouth, England.—Dr. Nash also quoted typhoid fever statistics from Yarmouth, where this disease had prevailed to a high degree for several years prior to 1900, when the sale of mussels from the River Yare was stopped. In 1901 the typhoid fever records showed only about 30 per cent. of the previous average, and in 1902 there was a still further reduction.

Brighton, England.—During the years 1894 to 1902, the health officer, Dr. Newsholme, investigated each case of typhoid fever in Brighton and found that out of a total of 643 cases 158 were directly ascribable to the consumption of oysters and 80 other cases to the consumption of other shellfish within the period of incubation. These shellfish in each instance were taken from layings proved to be exposed to sewage pollution. In the opinion of Dr. Newsholme 37 per cent. of all cases, as indicated above, is an underestimate of the effect upon that community of polluted shellfish.

Manchester, England.—During the years 1897 to 1902, inclusive, 2,664 cases of typhoid fever occurred, and according to the health officer, Dr. Nevin, 118 of these were strictly ascribable to oysters and mussels, and 156 more were associated with the consumption of other shellfish. In round numbers, therefore, in the city of Manchester about 10 per cent. of the typhoid fever during this period seems to have been due to polluted shellfish.

London, England.—According to Health Officer Murphy, of the Metropolitan District of London, more than 8 per cent. of all the typhoid fever in that district during 1902 was indicated by consistent evidence to have been caused by polluted shellfish.

In America the evidence obtained as to the relation between typhoid fever and shellfish has not been exhaustively studied, although it has received considerable attention in New York City, and in some other places. There are no adequate data on which to base any comparisons with the experiences in the English cities above cited. When the much-needed data upon this question are available it will probably be found that the wider use of shellfish in America than in Europe will be a factor; although, of course, the net result depends upon the number of infected oysters reaching a given population.

In the present state of the art, bacteriology does not afford ready and reliable means for the detection and isolation of the bacillus of typhoid fever when present in such numbers as ordinarily exist in nature. With difficulty the numbers present may be roughly approximated only in the laboratory when those present are excessively numerous due to artificial infection of the oyster or the water. Accordingly, in the absence of direct means of studying the distribution of this germ in oysters and associated waters, it becomes necessary to study the problem indirectly.

Along the latter line of distribution investigation there are five principal ways of approaching the subject, viz.: (a) Evidence as to the longevity of the typhoid germ in sea water. This evidence is, of course, considered in connection with the time interval required for the passage of sewage from the local outfalls to oyster beds in the vicinity.

(b) Topographical and physical evidence, such as distances, depths, volumes, tides, currents, etc., for studying each local problem as indicated in the foregoing paragraph.

(c) Comparison of the numbers of bacteria and organic contents of the water from above the oyster beds with that of sea water from unpolluted sources, paying special attention to the relative number of B. coli, which is the most prevalent species of bacteria in the intestines of man and other warm-blooded animals.

(d) Comparison of the B. coli contents of oysters (including the body, liquid and shells) from unpolluted sources with those from the locality in question.

(e) Evidence, so far as present methods of bacteriology permit, as to the behavior and duration of life of typhoid fever germs within and upon oysters which have been infected with this germ.

Available evidence indicates that this germ will live in unsterilized sea water in gradually decreasing numbers for periods ranging at least from about one week to one month, depending upon local conditions. No observer has noted any signs of the typhoid germ multiplying in sea water.

Evidence upon the life of typhoid fever germs in live oysters in sea water has been obtained by several observers by putting oysters from unpolluted sources into small receptacles containing sea water infected with typhoid fever germs. From time to time examinations were made of the tissues, pallial cavity, alimentary tract, shell water, etc., of the oysters. All observers have found that these disease germs penetrate the oyster body and live there in gradually decreasing numbers for various periods ranging from about one week to one month. In no case has anyone observed any signs of multiplication of typhoid germs within a live, healthy oyster.

Field notes the result of some experiments in which he observed a well defined growth of typhoid fever germs in some dead and dying oysters in sea water. These oysters were infected with enormous numbers of typhoid germs, and the conditions of the test would in this regard be rarely, if ever, duplicated in nature. The great mischief which could be done by one dead infected oyster among a lot of oysters suggests at once that this matter should be investigated most thoroughly.

The question of growth of typhoid germs on cooked oysters, in instances where some, but not all, of a lot of infected oysters are killed by cooking in the same receptacle, is a matter worthy of serious consideration. While typhoid germs form no spores and are killed by heat, it is not probable that heat as ordinarily applied in cooking oysters is nearly as great a safeguard against infection as is believed to be the case by many. Thus, Nevin recognizes this in reviewing the data secured at Manchester, and Herdman and Boyce advise that oysters should be sufficiently cooked; that is, raised to the boiling point and kept there for at least ten minutes. Clark and Gage found that while exposure for five minutes to a temperature of 55° C. killed the great majority of typhoid germs, a few survived a temperature even of 80° C. In some interesting experiments made by Hill it was found that the cooking of oysters, as ordinarily practiced, usually, but not invariably, killed typhoid germs.

During the past ten years it is safe to say that a majority of the more prominent oyster beds, fattening grounds, etc., in this country and elsewhere have been examined with considerable care either by official sanitary inspectors or by those who are competent to form a reliable general opinion as to their sanitary significance. Similar attention has also been given to other shellfish, especially clams, the life history of which is more or less similar to that of the oyster.

Sanitary conditions can be adequately decided upon when the surroundings obviously show either freedom from all pollution or when the sources in question are very seriously and objectionably polluted. Unfortunately, many oyster layings come within the intermediate class, generally spoken of as "doubtful" and about which it is difficult to arrive at a correct and reliable opinion as to the probable degree of pollution.

The preceding brief outline of some of the topics discussed by Mr. Fuller indicates the thoroughness with which he has covered the whole subject. He summarizes the results of his studies as follows:

Effects of Pollution.—There seems to be no room for doubt about typhoid fever and other intestinal diseases being produced to a limited degree by oysters and other shellfish taken from polluted waters. While some of the evidence is not above question and the data are extremely meagre for basing an opinion as to the effect of polluted shellfish upon the general prevalence of typhoid fever either upon a single community or upon a whole country, yet the English studies show that it is material and sufficient to call forth more study for means of prevention. Those who do not recognize any relation between pollution of shellfish and the causation of disease either have not looked into the matter or have biased views for commercial reasons, although it was recently rumored in this country that a French commission had reached the conclusion that oysters could not transmit typhoid fever. Regarding this reference to the French commission, coming by way of consular reports, it is found upon consulting the original reference that Prof. Giard's report is sound and conservative, according to general evidence. He concludes that typhoid fever may be transmitted by polluted oysters, although he believes that some of the cited cases are based on questionable evidence. He also states that the bacterial diseases of the oyster are not transmitted to man.

Oyster Cultivation in Grossly Polluted Waters. —There is absolutely no room for doubt about this being an unsanitary condition of affairs, and one which in the interest of all concerned should be prohibited by law, with proper authorities placed in a position to see to it that this practice is not allowed to continue.

Shellfish Cultivation in Unpolluted Waters.—As a considerable portion of the oysters cultivated in this country come from beds which are practically above suspicion on hygienic grounds, the interests both of the consumer and of the trade require that such sources should be accurately and honestly certified to in a manner similar to "certified milk farms," and by authorities whose technical ability and honesty are above question. The technical advisers of such authorities should be thoroughly trained in engineering, chemistry and biology in all of the various applications to water pollution as associated with the shellfish industry.

Shellfish Cultivation in Moderately or Slightly Polluted Waters.—This is the most difficult by far of the various conditions which should confront suitable authorities, as, from what has already been said, it is out of question to base an adequate opinion upon a single inspection or upon a limited number of analyses, on account of such data not being representative of all conditions met with, and therefore, perhaps misleading to a serious degree. Improved methods of study of this problem are very urgently needed, and the results of such improved methods should be applied most exhaustively in order that this matter may be clearly put on a basis fair to the consumer and fair to the oyster trade. One of the principal topics requiring thorough study is the practicability of relaying oysters coming from slightly polluted sources in pure water under such conditions and for such a period of time that the objectionable bacteria may be certainly eliminated.

Relation of Shellfish Pollution to Sewage Disposal Problems.—This matter has not yet been considered other than in a superficial way in this country, but it is clear that the time is approaching when the relative aspects of these matters must be carefully weighed. Speaking generally, it seems apparent that where small sewage disposal projects are associated with large shellfish industries, the latter as a business proposition should not be injured or destroyed when a relatively small sum of money produces a satisfactory purification of the sewage. On the other hand, where the sewage disposal question involves a very large center of population and its corresponding cost for purification beyond the point of preventing gross nuisances, then it seems that the small shellfish industry should become subservient to the larger public interests, and be abolished. Where the relative money values of the shellfish industry and of the sewage disposal question approximate each other, it becomes a matter for careful consideration and adjustment for each locality.

Nature of Supervising Sanitary Authority.—In this country the question of polluted shellfish rests largely with the local Boards of Health, who have the authority to prohibit the sale of such food within their city limits. Naturally, there are not many boards equipped with technical facilities to do much with this question. State Boards of Health when directly authorized by special legislation may take up the matter on broader lines, as in the case of Massachusetts. The general supervision of the shellfish industry in the United States, however, comes within the jurisdiction of the State Fish Commissions, who as yet have done very little with sanitary matters. To handle the matter adequately, it is obvious that further legislation is required, and differing, quite likely, in different states.

Much interesting discussion on this matter is contained in the fourth report of the Royal Commission on Sewage Disposal, which recommends a new central authority, thoroughly equipped to take up all phases of this matter in Great Britain, and which in turn along executive lines would work through the local River Boards.

The Practical Utility of Manual and Technical Training.

An address by Wm. Barclay Parsons before the National Educational Association.

Not being engaged in education, I approach the topic of this evening's discussion, namely, "The Practical Utility of Manual and Technical Training," not as an educator, but as one engaged in practical work, where both manual and technical training play their parts, and I shall speak, therefore, from the point of view of results achieved and of ends to be attained.

The statement is almost axiomatic that, any particular educational work, precisely the same as work of other kinds, must pass the supreme test of practical efficiency if it is to assume a permanent place. Unless special educational training can show some actual value in making men and women better able to meet the ordinary demands of life, no matter how desirable it may seem, it has no reason to exist, and must in the end give way to other work, or to other subjects that will employ the student's time more profitably. It is, therefore, by actual results, that we are to judge of the value of any teaching, and by this same standard, of the practical value of manual and technical training. The question is, whether students are sufficiently improved thereby to compensate them for the time spent.

Subjects that are taught in our schools and colleges may have one or both of two values: they may be useful in developing the reasoning faculties, thus fitting the student to deal later with the actual problems of real work, in the same way as gymnastics develop the muscles of the body and are thus useful, though one may not become a gymnast; or, the subjects may have a direct value per se, as do all subjects that will later have bearing on actual daily vocations. It is not for me, in a gathering of educators, to discuss the relative importance of any subject of the former class. Others who will address you will cover the value of manual training from the standpoint of mental development—if that phase of the question requires any consideration or argument—while I, within the narrow compass of this paper, will invite your attention to a consideration of the subject solely from the standpoint of practical utility, and with regard to better fitting young men for the actual demands of work to come.

When manual training was first brought forward it was with the view of its use as a means of mental development; it has, however, a much wider field, a more precise application, and an actual educational value of great practical utility. We are all conscious of the tremendous progress in mechanical development that has taken place within the past fifty years, more especially during the last twenty years, and that is still going on at an increasing ratio. It was not so very long ago that the great source of wealth was in agriculture, where work was performed by the most rudimentary of unskilled labor, while even in mining and in the mechanical arts implements were of the crudest form. On the strength of men's arms, legs and backs was the main reliance for power. To-day it is hard to call to mind a single trade in which machinery of intricate form does not enter in some degree, and usually to a great extent, machines requiring on the part of the operative some knowledge of mechanics, some experience in manipulation, and some skill in manual dexterity. The hand needle has given way to the sewing machine, the farmer's foot loom and spinning wheel to exceedingly complicated machines of great capacity, engine driven; the telephone is used in place of the messenger; a machine and not a pen writes our letters; while our stables have become repair shops for motor cars. Such are but a few of the many examples in our everyday life that once occur to one, where machinery is displacing handwork, and where skilled labor is taking the place of the unskilled. The change that has come about does not, however, stop with these. A moment's consideration shows us that our great crops are sown, gathered and harvested, not by the hand-sower, by the scythe and the flail, but almost wholly by machinery, and where farms are conducted profitably and on modern lines such means are wholly employed. Even at sea, where there is still rivalry between wind and steam as motive power, the former can be used to advantage only by placing an engine on a sailing vessel to hoist and work the sails, thus permitting a reduction in the size of the crew by the substitution of mechanical skill for ordinary labor, while the fishermen of small capital, instead of rowing or sailing each morning from the beach to the fishing grounds, are now going, in increasing numbers, to and from their daily work in gasoline-driven dories. Mechanical development has already invaded our homes, our offices, and is fast taking possession of every avenue of human industry, from the extensive field of transportation and the great factories, whose fires never go out, down step by step to the electric cooking stove.

A measure of the number of persons dependent upon mechanical pursuits can be obtained from the reports of the United States Census Bureau. The report for the decade ending 1900 shows that there were then 29,000,000 persons engaged in various occupations. Of this number, there were no less than 8,000,000, omitting entirely all those engaged in agriculture, employed in occupations where machine and tool knowledge formed the basis of work, while in nearly all of the others some such knowledge was desirable and in many cases essential. It is not an exaggeration to say that machine and tool work form so large a part of the daily vocation of the majority of all the working classes in this country that there is not a single calling where the worker is not required to show some familiarity with tools and where some proficiency in mechanical dexterity will not lead to his advancement. In fact, it would seem that after the great foundation of all education, reading, writing and arithmetic, there is no one subject of instruction of so widespread practical benefit as that of teaching the art of using the hands. With the masses an education that develops the thinking power alone is of small value; it produces a development that is unbalanced; it creates a power that is ineffective, that cannot be used. Give a man a rudimentary education, with an understanding of how to do things, and the educational foundation of productive capacity has been laid, which capacity governs the wage-earning power. The practical utility of manual training is the instruction of the rising generations in the use of tools, the education not only of the mind but of the hand and the eye, and in teaching a subject that will later be an actual portion of the life work of the majority of students.

The limit to which manual training should be carried is to be considered from three points of view: the elementary work in the lower grades, the specialized in the trade schools, and the higher in the technical colleges. As to manual training in the lower grades—the basis for the more advanced in the trade schools—you have already listened to an acknowledged expert, while of the specialized work in the trade schools you will presently hear one who has given the subject the closest study. As to its practical value in our technical colleges, we must differentiate between the technical college and the highest grade of trade school, especially in the matter of manual training. The one aims to turn out the professional engineer, educated not only in the technical sciences, but in the liberal arts as well, to whom time and money spent in procuring an education are quite a secondary consideration as compared with the acquisition of an education itself; the other aims to develop the highest grade of mechanic and general foreman. Although there is a great difference in the scope of the educational work in the technical college and the most advanced of trade schools, yet there is the similarity that both deal with mechanical appliances, but with this distinction, that the men of the latter will in practice have to do with their own hands their own work, while those of the former will direct other hands to do it. It is not essential, therefore, that a technical college should carry manual training to the same point of development as the highest grade of trade school does. In the education of the engineer there should be enough manual training to make him understand how things are made, to sufficiently familiarize him with casting and forging, hand and machine tools, engines and their adjustment, the winding of dynamos, and the connections of electrical devices, so as to give him the requisite knowledge of how to design, how the engine should be used and how construction results can be accomplished. In short, to make him conversant with principles rather than to develop manual dexterity.

This brings us to the question of the practical value of technical training itself and whether it is better that young men who are to follow a professional life in engineering should get their education in the offices of an older practitioner, as has been the custom in England, and is still to a large extent the universal custom in teaching the allied subject of architecture, or to gain the same end by passing through a technical college, the practice in America and Germany. To quote the growth of technical colleges is not necessarily a rational argument, but it certainly goes to show popular appreciation. In 1870 there were less than half a dozen institutions in the United States where a good technical education could be had, and the number of students was small. Today there are no fewer than 43 such institutions, with over 23,000 students enrolled.

Before considering the practical value of technical education, let us define what is an engineer and what is the vocation known as engineering. The word "engineering" is used here in its broadest sense, including all branches of professional work in applied science or construction. The word "engineer" is not, as is popularly supposed, derived from the word engine, a machine. There were engineers before steam was practically applied or before the development of engines in the modern acceptation of the term began. Both the words "engineer" and "engine" come from the same derivation, the Latin "ingenium," whose prime meaning is "natural quality, character, genius," and it in turn is derived from "gegno"—to produce. The engineer is, therefore, a man of "natural quality"—one capable of producing. The early engineers were military men engaged in fortifying cities and constructing battering rams and other engines of war. The first man to use the term "civil" engineer was John Smeaton, the eminent designer and constructor of the first Eddystone lighthouse, that guided safely into the harbor of Plymouth the East India merchantmen of the 18th century. He adopted this appellation to distinguish himself from his confreres as one working, not in military, but in civil undertakings. The profession of engineering, in its broadest scope, was later defined by Thomas Tredgold, when founding the Institution of Civil Engineers, as being "the art of directing the great sources of power in nature for the use and convenience of man." It is difficult to imagine a field of work of higher order, of wider scope, and for which a more complete previous technical training is essential.

The powers of nature, those great and mighty forces that surround us, that sustain and govern not merely our own small earth but the whole universe; powers that are without limits as to time and space, whose laws never vary, whose manifestations may undergo change but which never suffer loss, and which are the only things that we have cognizance of that are of perfect truth—these forces in all their might, from the great energy of the engine capable of lifting mighty weights, or the violence of an explosive rending mountains of rock, to the gentleness of the watch spring in your pocket, regulated to a variation of less than a second a day, are by the study of the engineer controlled and directed for the use and convenience of his fellow men. How little did Smeaton foresee the development of civil work, to which he applied a designative title! How little did Tredgold realize the far-reaching effects of a calling to which, it is true, he gave unlimited bounds! The responsibility of educating men who are to follow Smeaton, who are to realize the ideals of Tredgold, who are to understand, direct and make useful the powers of nature, rests upon such as you who make up this audience. It seems but necessary to repeat that definition of engineering which in simplicity of language, in directness of thought, in broadness of conception, has never been excelled, to at once answer the question whether such education is better given in special technical colleges or in the offices of some one practitioner. What are these powers of nature? They are not only those that we see or feel every moment—light, heat, steam, gravity, but also those studied by the electrician, by the chemist, by the physicist, by the geologist, and by the other disciples of pure science; those intricate forces that, whether matter consists of many or few elements, give it such a manifold and diversified character. When the total of human information of these several branches of science was comparatively limited, when the engineer could depend largely upon precedent, when progress was made by short and careful steps, it was possible for a sufficient education to be acquired under the tutelage of a single man, leaving it to the inherent genius of the pupil to self-develop. With, however, the vast and constantly broadening field of modern scientific knowledge, it is quite impossible for one man, or such a limited group of men as one office may contain, to impart to the young student the requisite instruction in all the properties of the forces and materials of nature that he should have as a general framework of his professional education. Although engineering, like medicine, law and the other learned professions, is divided into separate branches, nevertheless the modern engineer must know something of machine design, of electricity and its practical application, of hydraulics, transportation, structural construction, together with physics, geology and metallurgy. If such a structure be built on the solid foundation of a good education in the liberal arts, so much the better will it be, and obviously such a preparation can only be given in an institution with a corps of specialists. It seems a contradiction to say that as any profession becomes more specialized at the same time it becomes broader, but as a matter of fact the range of subjects to be studied does become wider. It is not necessary, in fact it is impossible, for any one to become expert in all branches; yet so interdependent are the several divisions, so interlocked are the various nature forces that some knowledge should be had of many subjects and much knowledge of few.

I gave you above numerical statistics of the growth of our technical colleges as an instance of the practical success of such education. Educational statistics of the engineering forces engaged in building the rapid transit subway of New York City were compiled and are both interesting and equally suggestive, as showing the extent to which technical training is availed of. The staff of engineers numbered about 200 at any one time, exclusive of inspectors, and was divided into three classes: the executive, or those engineers holding positions of responsibility, and who were called on for original thought in designing as well as for ability in execution; the assistant engineers, holding positions of less trust, men of less experience carrying out the orders of their superior officers, though still with responsibility; and third, the rodmen, those just beginning engineering work, called on for no originality, but acting entirely under instructions. All of these positions, except those in the first class, were filled after competitive civil service examination. Of the first two classes 86 per cent. were college graduates from our leading institutions, while of the third, where such education was not in any way a necessary requirement, not less than 58 per cent. had passed through some college of recognized standing.

During recent years we have been frequently admonished to lead "The Strenuous Life" by no less a person than the President of the United States, who has always been a vigorous exponent of his own doctrine. More recently an eminent French divine has been preaching the antithesis to "The Strenuous Life," namely, "The Simple Life." Judged from the cold standpoint of practicality, is either right? Should either "The Strenuous Life" or "The Simple Life" be our maxim? Does either as an ideal satisfy in full all the re-requirements of life? Strenuosity suggests, and may be nothing more than energy for good or for evil, vigor whose force, acting without guidance, produces no useful effect and entirely fails to come up to the meaning of "engineering," which is character, and the underlying motif of Tredgold's definition, which is force directed for the benefit of man. Simplicity, on the other hand, preached as a doctrine, calls to mind a gentleness deficient in vigor, or possibly a timidity that shuns a contest with the hard, unsympathetic conventions of life and an avoidance of the necessary and entirely proper complications that are an inevitable concomitant of modern development. Life itself is involved; everything about us is vast; and nature, with its sources of power, is complicated beyond human grasp, and all to an extent for which simplicity alone fails to present a satisfactory solution as a life guide. We need force, we need a vigorous force; we need that direction and avoidance of the unnecessary which is simplicity, but with either one alone there is something lacking. Instead of great force and latent energy without control, instead of quiet gentleness, or of power of control without vigor to be controlled, what we need is force and energy applied where necessary and always under control, always working to a definite purpose, and at the same time avoiding complications and unnecessary friction. That is, to have a life whose great underlying motif is effectiveness, and instead of speaking of the strenuous life or of the simple life, let us have before us as a doctrine "The Effective Life." What we need is not merely a man who acts, but one who does; that is, one who will do what he has to do regardless of intervening obstacles. Efficiency and effectiveness are the keynotes of success in actual life. They are also the lessons taught by every parable in the New Testament, even if that work is regarded as a code of ethics, and they form the spirit of that stirring definition of engineering which is based on the direction of the vital forces of nature and the doing of things for mankind.

Efficiency is the practical underlying principle in the work of technical education. In no other walk of life is actual efficiency so essential as in engineering. In other lines there is a place for the student, for the didactic, for him who would turn to his book to gather wisdom, but not so in technical work. Here there must be the man to do—to take those great and mighty forces and make them do effective work. Unless he can so stand up and do that, the engineer cannot succeed.

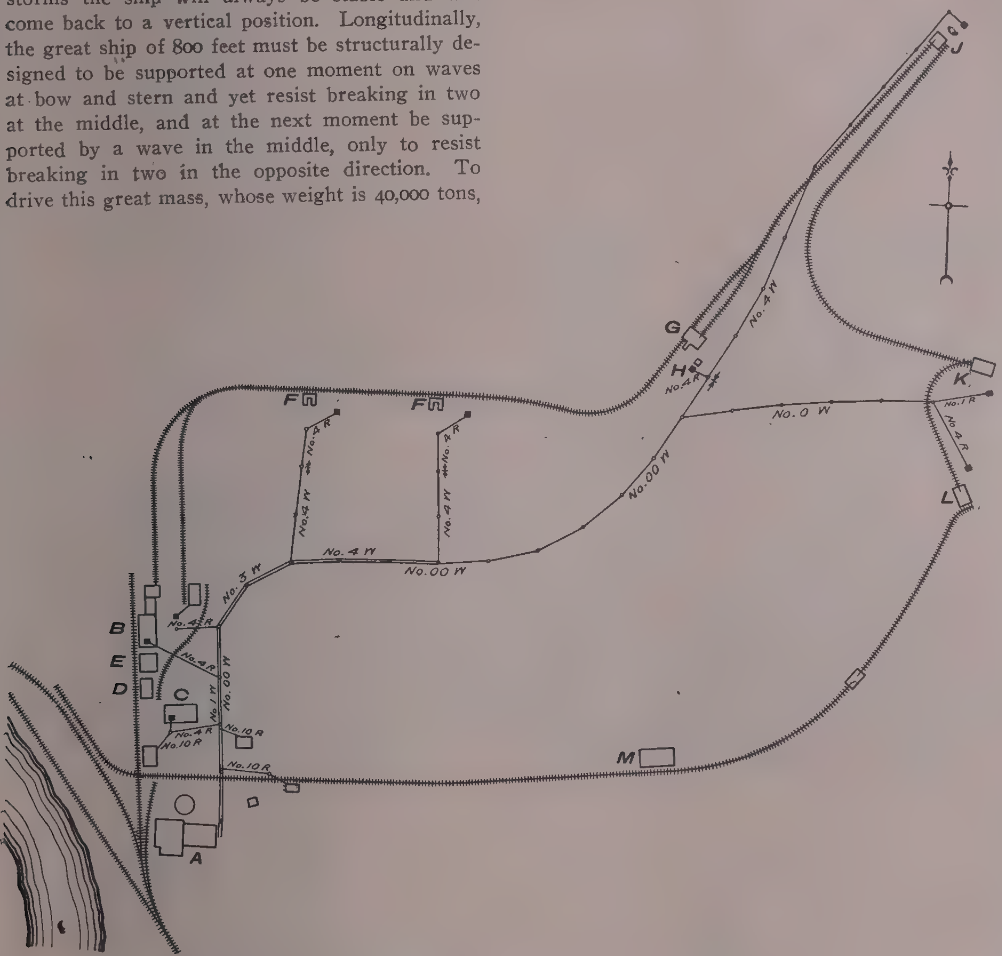
We are all cognizant of the great results already achieved by technical development, but have you ever paused to take the measure of any one example, to analyze some one of the results that we see daily produced and to estimate what it means? Let me give you one example, to which I have referred on other occasions, but which is not out of place here. You have all seen some ocean liner pass majestically to sea out of the port of New York, but have you ever thought of what that ship has been designed to do, and the amount of energy, expressed in simple language, that is required to propel her from shore to shore? You see the many decks, the several funnels and the tall masts. Below the water and out of sight there is still more than what is visible above, but all is so adjusted that no matter how buffeted by the storms the ship will always be stable and will come back to a vertical position. Longitudinally, the great ship of 800 feet must be structurally designed to be supported at one moment on waves at bow and stern and yet resist breaking in two at the middle, and at the next moment be supported by a wave in the middle, only to resist breaking in two in the opposite direction. To drive this great mass, whose weight is 40,000 tons, through the water at railway speed requires a force rated at 50,000 hp. So stated, it means nothing, but as each horse power is equivalent to one and one-half ordinary draft horses, and as each of the latter can do the work of eleven men, which, however, can work for only eight hours a day, thus requiring three sets of men, there would be needed to take the place of the same energy in the ship no less than 2,500,000 men. Here in one single case combined we have an illustration of great static stability and enormous dynamic energy, and the whole is an excellent illustration of efficiency. The structural strength and the compressed energy of the ship is strenuosity in the extreme, but a vigorous strenuosity under absolute control, and that control by one man at a throttle wheel is simplicity itself. Either one without the other is valueless; together they make the vital principle of which I spoke—efficiency.

You invited me to address you on the practical value of technical training as related to work in applied science. As to the necessity for such education of the highest order, there is, of course, no debate, and as to the proper method of acquiring it, there can be no question. Technical education has so many points of contact with professional work, it covers so wide a range, that one cannot discuss its details. For the moment we are dealing with fundamental principles only, the basis of the subjective and objective value of such an education, which can be summed up as efficiency leading to effectiveness. The one is the ability to do, the other is the doing. The responsibility of giving to technical education its practical value by making it thorough and efficient rests with you as educators, but efficiency alone will not complete the whole value. There must be instilled into it the great living principle that Tredgold had in mind when he spoke of directing the powers of nature for the benefit of man; there must be developed, not only in the education but in the educated, in all simplicity, the vigorous strength that is embodied in "The Effective Life."

THREE 16,000-H.-P. VERTICAL STEAM ENGINES designed to operate at 120 r.p.m. and to drive two reversing finishing mills have been installed in the Britannia works of Dorman, Long & Co., Ltd., Middlesbrough, England. The engines are direct connected to the finishing mills and are of the three-cylinder type, with 48 x 52-in. cylinders, each cylinder equipped with a separate throttle valve. The crank shaft, which measures 21 in. in diameter in the journals and pins and weighs 21 tons, is stated in Engineering to have been made in a single forging.

Electric Drive at a Powder Mill.

A new powder mill, built by A. Senior & Son Co., was completed and put into operation a few months ago at Morrow, O. The mill is situated on the Miami River and on the Cincinnati Division of the Pittsburg, Cincinnati, Chicago & St. Louis Railroad, thus having good water and railroad facilities, and is driven and lighted by electricity generated at the company's own power house. All of the electrical apparatus is of General Electric make.



Plan of the Grounds of the A. Senior & Son Co. Powder Mill.

The grounds of the plant are laid out in the form of an irregular oval about one-half mile long. The land is much higher at the eastern than at the western end. A narrow gauge track, starting at a charcoal house at the west end, runs completely around the grounds, passing a magazine or storage house and terminating at the railroad siding. The various buildings are placed along the track in proper relation to the necessary sequence of manufacturing operations, and the buildings are well scattered, to prevent any accident which might occur at one building from destroying others.

The power house is at the southwestern end of the grounds. It is the largest building of the plant, and was designed so that additional machinery, equal to the present capacity, may be installed when required. The boiler room contains two 72 x 18-in. tubular boilers. The engine room contains one 12 x 24 x 36-in. cross-compound condensing engine belted to a three-phase, 60 cycle compensated alternator. The switchboard consists of a generator panel mounting an automatic oil switch and other usual instruments, and one two-circuit three-phase feeder panel equipped with recording wattmeter. Two three-phase feeders are led from the power house, one supplying power to the western end of the grounds and the other to the eastern end.

All of the motors are Form K, with the exception of the 40-h.-p. motor installed in the soda grinding room, which is Form L. Due to the great danger of explosion in most of the buildings, all electric wires and all of the motors, except in two cases, are placed outside the buildings, and the power is carried in by a shaft projecting through the wall of the building with a pulley at its outer end to which the motor is connected by a rubber belt led through a covered way. The two exceptions to this arrangement are the carpenter shop, driven by a 10-h.-p., 1,200 r.p.m., Form K motor, and the soda grinding room, driven by a 40-h.-p., 900 r.p.m., Form L motor. Although there is no danger of explosion in either of these places, the fire risk is great in both, and the soda grinding room is an especially bad place for a blaze to start, as the fine soda dust collects on everything, and when once ignited it is practically impossible to extinguish the fire which results. It was deemed quite safe, however, to install induction motors, with their complete freedom from moving contacts and sparking. These buildings are situated at the west end of the plant. Near by are the charcoal room and the brimstone room, where these ingredients are pulverized. One 30-h.-p., 900 r.p.m., Form K motor drives both pulverizing outfits.

Following the motor applications around the plant in the order in which they operate to produce the manufactured product, we come to two 30-hp., 900-r.p.m., form K motors, each driving a wheel-grinding mill where the various ingredients of the powder are brought together, mixed and ground up under enormously heavy cast-iron wheels. It is in these two buildings that explosions are most likely to take place. The foundations are made large and heavy, and an explosion can damage only the superstructure, which is of light construction and is easily and cheaply replaced.

Next is a 20-hp., 900-r.p.m., form K motor, driving the press mill, where the product is formed into cakes and then passed through a machine which breaks the cakes up into grains. The same motor supplies power to the pump house, where the heavy hydraulic pressure required by the press mill is generated.

From here the powder goes to the corning mill, driven by a 15-hp., 1,200-r.p.m., form K motor, where the product is sifted and all dust removed. Next comes the glaze mill, driven by a 50-hp., 220-r.p.m., form K motor, where the powder receives a finish by being treated to a coat of graphite.

The last operation takes place in the sizer mill, which is driven by a 5-hp., 1,200-r.p.m., form K motor. In this mill the powder is passed through sieves in order to separate it into various lots, according to size. It is then packed in kegs, and finally stored in the magazine ready for shipment.

In all cases where danger of explosion precludes the installation of electric motors and their necessary wiring inside the buildings, electric light wiring is equally objectionable, and the buildings are lighted from outside the windows by means of incandescent lamps placed in headlight reflectors which throw the light into the room. All lighting is by 110-volt incandescent lamps, which are placed five in series across the line to avoid the use of transformers. In some instances, as in the engine room, clusters of five lamps are used.

No method of heating the various mills has been installed, and in cold weather those working at the west end of the grounds are obliged to go into the power house to warm themselves. Near the two-wheel grinding mills an electric heater has been installed for the comfort of the workmen, in a small house built especially for it. Another such installation has been placed at the east end of the grounds near the glaze mill.

The capacity of the plant is 400 to 500 kegs of powder per day. The manufacture goes on continuously, day and night, a condition which calls for reliable and high-grade electrical machinery, especially in the power house. The General Electric apparatus installed at this plant has been eminently successful. It was but a few years ago that powder mill operators ridiculed the idea of using electric motors in the manufacture of gunpowder. Today, however, electric power, when properly installed, is considered ideal for this industry.

A British Opinion Concerning Power Gas.

Last spring Mr. Dugald Clerk delivered a series of lectures before the Society of Arts in the course of which he gave the following summary of his views concerning various classes of gas for power purposes:

Many attempts have been made to utilize cheap bituminous fuel for producers, but so far the early commercial stage only has been reached. Commercial success here will come in the near future, owing to the great further reduction in the price of fuel for gas. In the present suction producers, the fuel used is anthracite, and anthracite in London, and wherever there is much carriage, comes to about 24s. a ton. If one could use ordinary engine slack, which can be got at most places at 10s. or 12s. a ton, or even less, one would have a corresponding reduction in the cost of motive power, and instead of coming out at a ninth of a penny, the cost might run down to as low as a twentieth of a penny. Scotch anthracite can be delivered at Glasgow at 15s. per ton, so that in Scotland power may be obtained at a cost of about 1-15th of a penny per horse-power hour. Messrs. Crossley have recently produced a bituminous producer which seems to be working very fairly well. I have only seen one at work, but it was working very well indeed. It is rather larger and has more plant about it than an anthracite producer, but still the fuel is so cheap that no doubt it is worth a great effort to get something of that kind. Other attempts have been made, and I wish to distinguish between the two classes of those attempts. There is not much difficulty in making producer gas for gas engines from bituminous fuel, if you are content to put up a large scrubbing plant such as is used with the Mond producers, and such as is used in a gas works; but people using steam boilers are accustomed to see a very large generation of power in a very small boiler space, and they do not look upon the large costly plants which are used in some places, although very useful, as solving this particular problem of getting a producer that will work just like a steam boiler with the ordinary fuel. So much for the suction and producer gas generally.

I must now consider shortly the question of blast furnace gas. Mr. Thwaite—I am glad to say an Englishman—demonstrated in 1895 that the so-called waste gas from blast furnaces could be used in gas engines. He built an engine and plant which was very successfully applied at a blast furnace in Britain, only on a relatively small scale. He showed quite clearly, however, that such gas from blast furnaces could be efficiently used for the purpose of motive power, and that it did not want a too expensive course of scrubbing. In England his work was not taken up with any enthusiasm—one does not quite know why, but some German and Belgian engineers took the problem up with great earnestness. The first to attack the problem of using blast furnace gas, after Mr. Thwaite, on a really large scale, was the Cockerill Co., at Seraing, in Belgium. They fitted up a 200-h.-p. gas engine, designed by M. Delamare-Deboutteville, who unfortunately died some time ago—a very able engineer, who devoted himself to large gas engines. They further took gas from the blast furnaces of the works at Seraing, and they found that it would operate a 200-h.-p. engine practically without scrubbing at all. The gas engineers in Britain, and, in fact, all those who had had experience in gas engine work, had always felt that the great difficulty in attempting to work blast furnace gas at all was the difficulty of scrubbing, because a very small amount of grit or tar coming in with the gas spoils an engine. The manager of the works, Mr. Greiner, a very able engineer, became so delighted with this success, and with the absence of scrubbing, that he wrote a very interesting paper, in which he announced that the scrubbing difficulty, and the dust difficulty, was a myth of the imagination of engineers; and he built a very large Cockerill engine, which was exhibited in Paris, and which was called a 1,000-h.p. engine. He got that to work successfully. Then he took orders for a very large installation in another part of Germany, at Differdingen, and when he got his plant to work there he found, unfortunately, that what was true of Seraing was not true of Differdingen. He found that both his pistons and his valves were in serious trouble in a very short time because of dust. He found then that dust in gas depended very largely on the composition of the iron ore which was being smelted. In one district a gas was obtained which was practically free from dust; in another district the gas was laden with a fine silicious dust. There were two difficulties: one was the dust and the other was the tar. For a long time very considerable effort was made on the continent to get over these difficulties, partly by scrubbing with ordinary scrubbers, such as are used in ordinary gas works, and partly by using a centrifugal separator, whirling round the gas with a great velocity, and a spray of water, they were able to separate out both tar and dust, and that difficulty may be said now to have been removed. Another difficulty was the cooling of the gas: as the gas leaves the blast furnace it is very hot, and to cool that great volume of gas, many cubic feet an hour, would be a difficult matter with water, so that air cooling is mostly used.

As the result of this work, there are now on the continent quite a number of installations of engines using blast furnace gas. At Hoerde there are two distinct systems in operation—the Deutz and the Oechelhauser. The Koerting and Cockerill engines are also largely used.

For a time English manufacturing engineers fought rather shy of these engines, because the risk seemed too great; but now the subject has been thoroughly taken up, and the engines are being established at a very cosiderable rate in this country. There are three places where they are at work: one is at Messrs. Cochrane's Works at Middlesborough, where they have two Cockerill engines, one 500-horse tandem double-acting, which works very well indeed, and another large engine of 600 horse-power, with a single cylinder. Then at Sir Alfred Hickman's, at Wolverhampton, they have several systems at work, including Cockerill, Crossley and Premier.

Messrs. Mather and Platt, of Manchester, too, have taken up the subject, and they have built engines for blast furnace and producer gas—the Koerting 700-horse for blast furnace gas, particularly.

Messrs. Beardmore, in Glasgow, have now running a large Oechelhauser engine driving a rolling mill, and they have arranged a gas plant using bituminous fuel and scrubbing very extensively in order to make the gas fit for use in the gas engine. Altogether there is a very considerable movement at present, and I have no doubt in the very near future we shall have very many of these large engines working and utilizing some part at least of this waste 1,000,000 horse-power of gas.

I do not, however, think that English engineers have been too slow. In England I consider that we have done our full share, both in the theory and practice of the gas engine, although on the continent, no doubt, they feel the want of the large gas engine more than we do on account of the greater cost of fuel. Now that the attention of English ironmasters has been called to it, they will undoubtedly find the large gas engine help them in the struggle against other nations.

I now come to another important matter, and that is the question of the distribution of gas from a central station. The production of power gas for distribution from a central station has long been a favorite scheme of many engineers. Many years ago the late Sir William Siemens was very much in favor of such a scheme, and he for a long time advocated the establishment of central power gas stations and the distribution of gas for power from central stations—not gas for lighting. A very great and important experimental installation is just on the point of being completed for the South Staffordshire Mond Gas Company. I am informed by the engineer of the station that this great establishment will set to work in about a month, and will distribute cheap fuel gas over an area of something like 120 square miles. The maximum supply with the present plant, although there is room for extension, is something like 15,000 horse-power.

The Mond gas differs from ordinary producer gas in this: in addition to making the gas, the ammonia that is in the coal is saved. Many coals contain a proportion of nitrogen, and if these coals on being decomposed are not heated too highly ammonia is formed and is not decomposed. To keep the temperature of the producer down sufficiently, the Mond practice is to flush the producer through with a very large volume of steam in addition to the air—much more steam than is wanted for the chemical decomposition. About 2½ tons of steam are used for every ton of fuel. The inflow of steam into the producer has two purposes; the one is that it keeps down the temperature and prevents the ammonia being lost; the other is that it prevents the formation of clinker, and the stopping up of the producer. In this arrangement to get the ammonia out, it is necessary after scrubbing and getting the tar out of the gas to scrub the gas in great acid towers, making quite a gas works installation. This does not belong to the type with which I consider the producer should be concerned; that is, the type of producer which takes the place of a steam boiler and does its work with no more complication than the boiler.

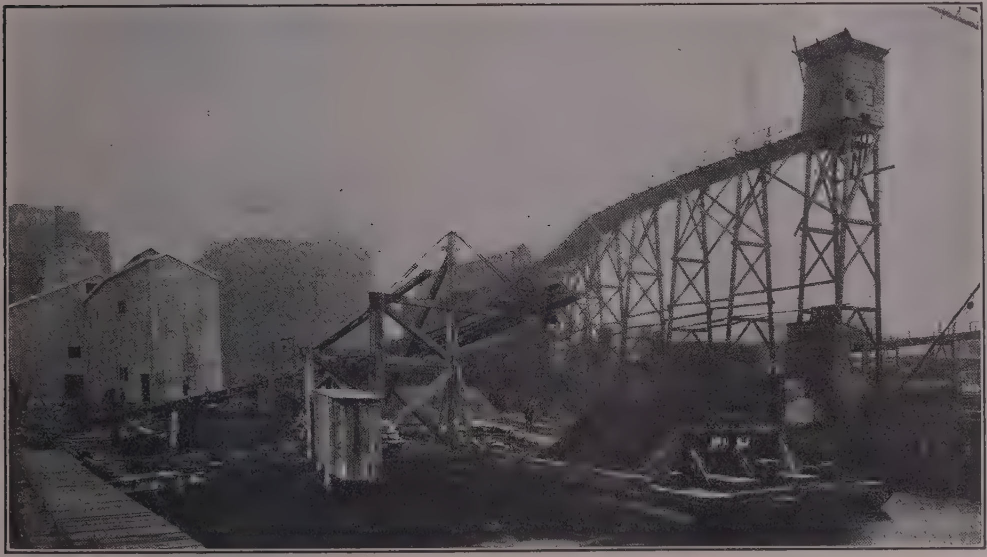
To distribute the Mond gas it is necessary to put it under some pressure, because the volume required is so very great. The calorific value is only about one-fourth or one-fifth that of ordinary coal gas. The consequence is that to distribute this gas over large areas it is necessary to put it under very much heavier pressure than is used with coal gas. The installation is therefore provided with a compressing house, intended to compress the gas for delivery in the mains. Mr. Humphrey tells me that a test was made recently at this establishment in which air was delivered along a main five miles long from these compressors at the rate of one and a half cubic feet per hour. If that were pumping gas this rate would be fully equal to about 15,000 horse per hour. This rate of delivery was attained with a pressure of 10 lbs. per square inch at the central station, so that it is thought that ample pumping plant and ample pipe accommodation have been provided to take the enormous volumes of gas necessary in this system. It will be very interesting indeed when this installation starts. It is one of the largest and most important experiments in progress in the world, and all engineers look with interest upon it, and wish it every possible success.

In carrying on the operations of this great station it is required to pump water and acid to absorb the ammonia and to keep up the general circulation in the system. A large pumping house is, therefore, provided in addition to the other large erections, the whole forming a very important station.

The same trouble which is met with in blast furnace gas is also met with in gas of the type of Mond gas, the tar being the great difficulty. If there were no tar to deal with, all these matters would be very simple, but in a large installation, such as this South Staffordshire Company's installation, there is no real difficulty, because there is space enough to build up the scrubbers; but if anything of that sort had to be done on board ship, say, it would be a very different matter.

Excavation and Pile Driving, for Brooklyn Anchorage Manhattan Bridge.

The Brooklyn anchorage pier for the Manhattan Bridge across the East River at New York is a concrete structure with stone facing which is about 182 ft. wide, 237 ft. long and 151 ft. in extreme height above the footings. The site was explored by nine preliminary test borings which indicated sand, gravel, boulders and clay in irregular strata down to rock at a depth of from 70 to 75 ft. below mean high water. Tests of the soil were made by loading it and by driving piles and from these and a study of the character and conditions it was decided to drive foundation piles about 5 ft. centers at the rear of the anchorage and 3½ ft. centers at the front. The tops of these are cut off 10 ft. below high water and are embedded in the concrete which extends to 12 ft. below high water.



Belt Conveyor for Loading Deck Scows.

The contract for the construction of the pier was awarded to the Kosmos Engineering Co., Brooklyn, Mr. E. H. Gaillie, President, with a provision for the completion of the work in 450 calendar days and $500 a day penalty or bonus for each day more or less than that time. A pile dock was built extending from shore line to beyond the tower pier and was connected with the anchorage site by a 36-in. gauge surface track about 900 ft. long connected at the shore end with branches running to the farther end of the anchorage on center and side lines. Excavation was commenced with pick and shovel and the spoil was loaded into 3-yard wooden side-dump cars by means of two derrick cars made by the contractor. Each car had a 30 ft. boom of about 5 tons capacity, and moved on a standard gauge track laid on top of the bank convenient to the track running to the dock. Excavation was made in benches about 9 ft. high and the spoil was shoveled into one-yard dump buckets on cars running on narrow gauge tracks in the bottom of the pit. These tracks radiated in all directions and delivered the buckets to the two traveling derricks above. There was also installed a traveling derrick with a 60 ft. boom and a 1-yard Hayward orange peel bucket with which a portion of the excavation was done.

At first the loaded dump cars were drawn to the dock by teams, but later they were hauled by 15-ton steel motor cars operated by type 60 General Electric motors of 50-h.p. When the excavation was commenced the spoil was removed by deck scows and used for filling at Greenville, N. J., for the Pennsylvania railroad improvement at that place. In order to load these scows a 20-in. belt conveyor 200 ft. long, made by the Wilson Mfg. Co. was installed on the dock, as shown in the accompanying photograph. The conveyor belt was inclined at an angle of about 20 degrees with the horizontal, so that its upper end was about 25 ft. above high water and cantilivered beyond its support, so that the scow could be brought directly underneath for loading. The lower end of the belt passed between two cribs built up 3 ft. above it and covered with loose transverse planks on which the contents of the dump cars were discharged over an apron which, although it extended below them nearly to the belt did not deliver directly to the latter. The belt was loaded by attendants, who turned the successive plank edgeways, thus gradually distributing the spoil on the belt. The work at Greenville assumed such condition that no more filling could be taken.

After the excavation was partly completed bottom dump or seagoing scows were furnished, which could not be moored under the end of the conveyor belt, which was then abandoned and the loading was accomplished by a stiff-leg derrick with a 60 ft. boom, seated on the extremity of the dock. The pivots on the car trucks were removed and the car bodies were used as simple boxes or scale pans, seated flat on the car floors, from which they were lifted and reversed over the scows by four chains attached to their corners.

Some difficulty was at first experienced in emptying all the sticky material from them, but this has been obviated by an ingenious expedient. As originally constructed, the bodies had one long side hinged by bars from each end pivoted in the centers of the end walls of the cars and operated by hand levers. The levers were removed and the lower edges of the hinged sides provided with latches to lock them shut and with rings engaging the hooks of two of the hoisting chains. The boxes are lifted from the cars and set on the deck of the scow, the chains slackened and the latches opened. When the hoist is again operated the chains first pull up the revolving side to its open position and then lift the box, revolving it until the open side is down and all the contents are discharged when it is lowered on the car truck, the side latched shut and it is sent back for another load and so on. These operations require only one man besides the derrick man and one car can make a round trip in 10 minutes. The total excavation is about 40,000 cu. yds., and is now nearly completed, as much as 600 cu. yd. having been excavated by 40 men in 10 hours and removed in 8 dump cars.

As the excavation progressed the soil was found very irregular and many boulders were encountered. Generally the banks were hard and stood pretty well at a steep slope even at the maximum height of 20 ft. No retaining was necessary for the protection of the excavation, but sheet piles were required to be driven to a depth of 12 ft. (24 ft. below mean high water) below the bottom of the pit to prevent possibility of movement of the sand after it is loaded by the finished pier. A Vulcan steam pile driving machine and three ordinary pile drivers with 2,000-lb. hammers were installed to drive the bearing piles of which about 2,500 are required. They are from 14 to 16 in. diameter at the butt, average about 40 ft. in length and are mostly of spruce and unusually straight and good.

Great difficulty has been experienced in driving them on account of the numerous large and small boulders and gravel encountered and a thin stratum of hard pan which is passed through at varying depth below the bottom of the pit. With the hammer alone they can be driven only about 8 or 10 ft., but with the aid of a powerful hydraulic jet they are generally put down 40 ft. A 14x8x12-in. Worthington steam plunger pump, operated by a 100-h.p. locomotive boiler has been installed and delivers river water through a 4-in. pipe to the pit where it has four valved connections to lines of flexible armored hose 3-in. in diameter and 100 to 150 ft. long made by the Gutta Percha and Rubber Mfg. Co. The extremities of these lines are coupled to 3-in. extra heavy steel pipes about 6 ft. long, bent to a curve 2 ft. in diameter. The other end of this curved piece is coupled to a straight pipe 40 ft. long with a ¾-in. circular nozzle at the end. This pipe is suspended from the pile driver leads by a line operated by a capstan head on the hoisting engine and attached to the curved section. It is lifted to a vertical position over the location of a pile and is sunk by the jet at about 150 lb. pressure and by its own weight. If it encounters boulders the jet is played on them and worked around their edges and the pipe is repeatedly sunk on all sides of them so as to undermine the boulder and gradually sink it down below the position of the pile. By the continued use of the jet the ground is softened, obstructions are displaced and a hole is made into which the pile is driven by the hammer, the jet being worked around its sides if necessary as it is driven. In this way piles are driven where it would be otherwise impossible to drive them and frequently boulders of 2 cu. yds. are carried down and are even considered beneficial in providing for the piles footings which are thoroughly compacted by smaller stones and gravel washed down with them and wedged around them.

The penetration of the piles is very irregular, sometimes being several feet for one blow and sometimes being little or nothing for several blows. All of the piles are pointed and have their upper ends banded, and it is noticed that where there is little refusal for the last blows of the hammer the resistance increases for a number of days and finally develops to a large and satisfactory amount. The driving is so hard that the machines sometimes do not drive more than one pile an hour and some pile heads are badly broomed.

The 12-in. Wakefield sheet piles are driven in the same manner as the bearing piles, and although guide rangers are used only on one side and they are driven without cramps, very good alignments and joints have been secured. In some cases boulders 10 ft. or more in diameter have been encountered and proving too large to be displaced by the hydraulic jet have made it necessary to relocate the pile to clear them. Each hydraulic jet discharges about 8,000 gallons of water an hour at 150 lb. pressure. This water collects in a sump and is pumped back to the river by electrically operated centrifugal pumps through a 2x1-ft. wooden flume. Except the steam pump and steam hammer, all the plant is operated by a 220-volt current from mains of the Brooklyn Edison Co. The motors are made by the General Electric Co.

The designs and execution of the work are under the direction of the Bridge Department of Greater New York, Mr. George E. Best, commissioner; Mr. O. F. Nichols, chief engineer; Mr. R. S. Buck, consulting engineer; Mr. H. D. Robinson, engineer in charge, and Mr. D. E. Baxter, resident engineer. Mr. Gustave Kaufman, chief engineer, and Mr. C. C. Harley, electrical engineer for the contractors, have designed and installed the plant.

Traveling Derrick and Service Track for Excavation, Brooklyn Anchorage Manhattan Bridge.

Improvements of the Elgin Water Works.

The city of Elgin, Ill., has recently sunk four deep wells, installed pumping machinery in a shaft connected at the bottom by tunnels with the wells and built two 1,000,000-gal., covered, storage reservoirs, with a view of abandoning the Fox River as a source of the municipal supply except in emergencies. The river water was pumped through pressure filters, and the distribution system has been under direct pressure for several years, but the filters will be cut out of service and the erection of a standpipe is being considered to do away with the direct pressure pumping. The arrangement and construction of the improvements were described in the recent reports of the Water Department and the Board of Water Commissioners, and the following notes have been taken from those reports.

The wells were sunk near the old pumping station on the river bank and the shaft driven at one end of the building and covered by a brick addition to the station. One of the wells is at one side of the building and is 2,000 ft. deep; the other three are in a group on the other side and are 1,300 ft. deep. They are 16-in. in diameter at the surface and are reduced to 8 in. in diameter in their lower portions, with pipe casing to a depth of 121 to 129 ft. to shut out the surface water. The first water-bearing stratum was found in St. Peter sandstone at a depth of 560 to 702 ft., and the next in Madison sandstone at 1,050 to 1,300 ft. The shaft is 120 ft. deep and 9 ft. in diameter, and was constructed through the limestone and into a stratum of clay which are below the stone and gravel strata at the pumping station. The shaft and the tunnels are lined with concrete, and two 4,000,000-gal. centrifugal pumps are placed in alcoves at the bottom of the shaft. These pumps draw from the four wells through suction connections laid in the tunnels and discharge in the two storage reservoirs on the surface. They are operated by rope drives on vertical engines at the surface in the addition to the station building.

Two horizontal tunnels 5 ft. in diameter are driven from the shaft and tap the wells at a depth of 115 ft., which is 11 to 17 ft. above the lower ends of the well casings. One tunnel taps the well which is on one side and the other one and its branches top the three wells on the opposite side of the building, the two tunnels having a total lengh of 528 ft.

A large amount of water was encountered in sinking the shaft, and considerable difficulty was also experienced in driving the tunnels. The water in the shaft came from fissure basins 39 to 48 ft. below the surface, and at another point before rock was reached quicksand was uncovered which appeared to come from one side of and from under the filter building, resulting in the lowering of some of the filters and cracking the walls of the building. These conditions necessitated the use of the pneumatic process under 12 to 16 lb. pressure until a stratum of clay was reached, after which the concrete lining was placed under water. Openings were left in the concrete as it was laid and the water behind the lining allowed to escape through them until the concrete had set, when they were closed and the water shut off. One of the well casings was disturbed in blasting the shale in one of the tunnels, and as the well was not plugged the tunnel and shaft were soon flooded. The well was then plugged and after the water had been pumped out the tunnel and shaft were completed.

The leakage in the shafts and tunnels is considerable, so bulkheads were built in each tunnel to shut them off from the shaft. Pumps were also installed at the bottom of the shaft to remove the seepage and keep the rope drives of the pumps dry.

The reservoirs, 90 ft. in diameter and 21.5 ft. deep, are built with concrete floors and side walls and a truss-frame roof. The side walls are reinforced with Johnson bars and are 36 in. thick at the bottom, with a batter on the outside reducing them to a thickness of 18 in. at the top. The 16-in. discharge pipe from the pumps in the well shaft enters each reservoir 14 ft. above the floor and extends up above the high-water line, where it connects with an aerator. The aerator consists of a short piece of 16-in. pipe with closed ends and is placed horizontally on the top of the vertical portion of the inlet, with 100 1-in. holes in it, which distribute the water and liberate the gases brought up from the wells. The outlet from the reservoirs is a 20-in. pipe leading to the suction of a 6,000,000-gal., Holly, high-duty, compound, horizontal pumping engine and two 3,000,000-gal. Worthington pumps in the station building. Each reservoir is also provided with a drain pipe leading to the river, and the piping connections are arranged so either reservoir may be thrown out of service without interfering with the other.

A guyed derrick with a boom considerably longer than the radius of the reservoir was set up in the center of each reservoir and used in concrete laying. The concrete was mixed between the reservoirs and loaded in buckets on small flat cars running on a light railway to the edge of reservoirs, where the buckets were lifted by the derrick and the concrete dumped in places.

The maximum capacity of the deep wells is 2,500,000 gal. per 24 hr., and the average daily consumption is about 2,800,000 gal. per 24 hr., with a maximum consumption of 4,000,000 gal. An appropriation has been made to build a standpipe which will give, with the reservoirs, a reserve capacity of about 2,250,000 gal., and as steps are being taken to equalize the supply and consumption, the use of filtered river water will be entirely avoided. The old filter plant has been overhauled, however, and will be kept in reserve so that water may be drawn from the river in an emergency.

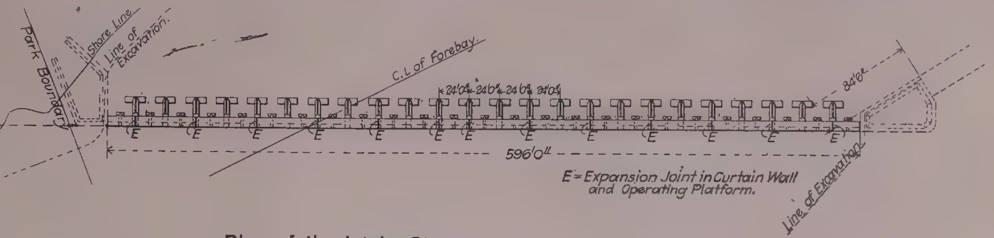
The Failure of an Earth Dam.

An inadequate spillway caused the washout of an earth dam belonging to the Bridgeport, Conn., Hydraulic Co. a few weeks ago, but fortunately the other reservoirs of the company are ample to prevent any shortage of water in the city. The catchment area above the dam that failed is estimated at 24 square miles and the runoff is regulated somewhat by two ponds. An extraordinarily heavy rainfall flooded the stream, however, and the spillway was surcharged, allowing the dam to be overtopped and washed out. The structure was not built by the company, but was a mill dam built fifty years ago, at a time when millwrights worked by intuition rather than technical knowledge. It is surprising that more of these old dams with inadequate spillways are not washed out, for New England is thickly dotted with them. In Rhode Island there is a State supervision of all dams, but elsewhere their construction is controlled only by a desire for permanent construction or a fear of damage suits.

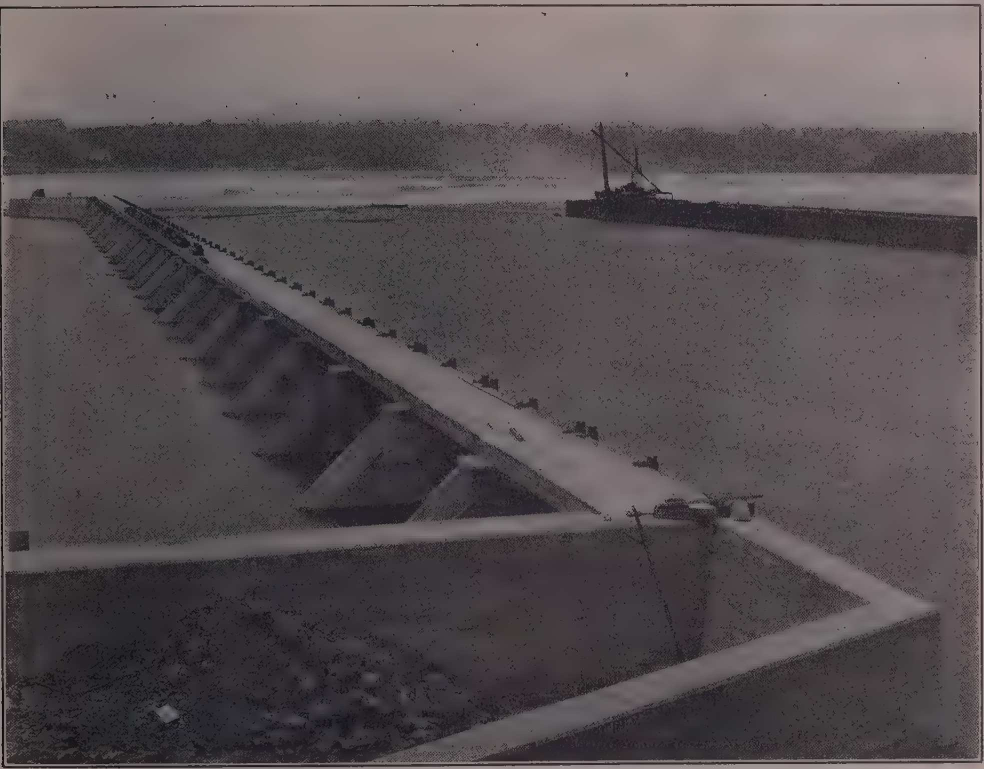
Telephony is now carried on daily with success between Boston and Omaha, over a line having a total length of 1900 miles. There now remains a gap of only 170 miles in the Bell lines from coast to coast which will probably soon be built.

The Intake of the Ontario Power Co.

The intake structure of the headworks of the Ontario Power Co., at Niagara Falls, has been built entirely of concrete, with reinforced concrete in a considerable part of the work. The general features of the scheme of development of power from the flow of the Niagara River at the Falls by this company were fully outlined in a series of articles in The Engineering Record beginning Oct. 8, 1904. The headworks of the company's power plant are on the Canadian side a little more than a mile above the Falls. They consist of an intake structure, outer forebay, screen house, inner forebay and gate and head block house, the general arrangement, design and construction of all of which, except the intake, were completely described in the articles to which reference has been made.



Plan of the Intake Structure of the Ontario Power Co.



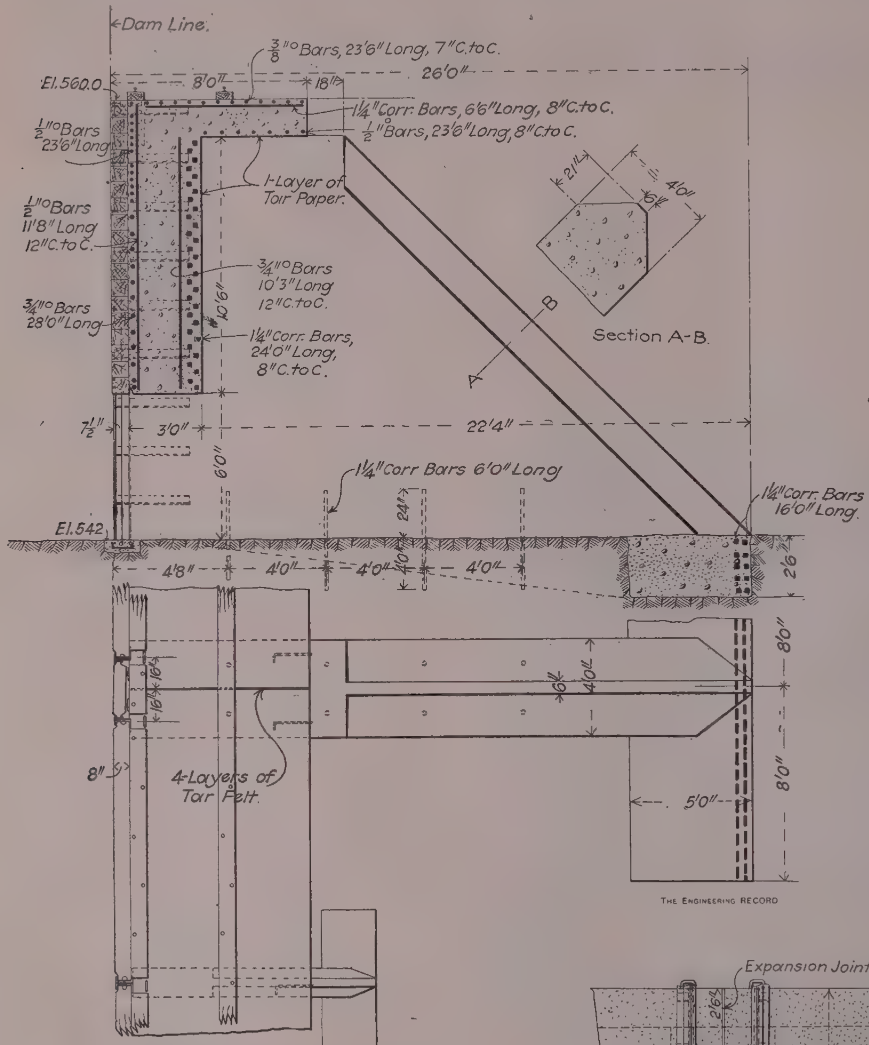
The Intake Structure of the Ontario Power Co. from the Shore Abutment.

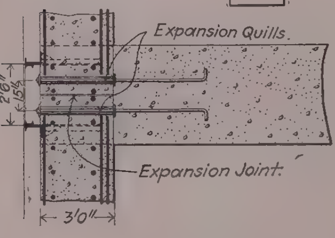
The intake structure is a heavy, partially submerged, reinforced-concrete curtain wall, 596 ft. long, supported by monolithic concrete piers on 24-ft. centers, with smaller reinforced-concrete piers midway between the main ones, the curtain wall joining a rock-filled concrete abutment at each end. The location of the intake with reference to the direction of the natural currents in the river at the site was determined only after considerable investigation of these currents. The intake was built with an angle of 45 deg. between its face and the river bank, and with its face at an angle of 135 deg. with the direction of the stream flow. A confining wall with its crest at low water and the last 100 ft. of it forming two submerged spillway weirs, is built nearly parallel with the river currents from the outer abutment, forming with the intake structure and the river bank an outer forebay covering 8 acres.

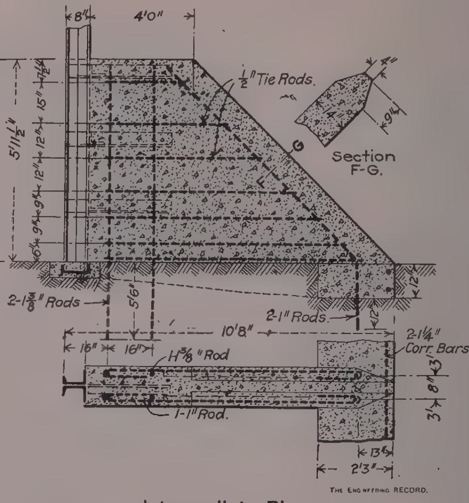
The design of the intake structure as built was considerably changed from the design included in the general plans outlined in previous descriptions in this journal. The original design included a curtain wall 21 in. thick and 11 ft. deep, and a floating log boom to protect the intake from damage by ice and floating debris was also considered in it. The curtain wall as built is 3 ft. thick and 12 ft. deep, with its lower edge 6 ft. above the rock bottom of the excavated forebay floor, leaving the top of the opening at the bottom of the wall submerged 5 ft. at low water. The wall is built monolithic at the top with a horizontal reinforced-concrete slab, 18 in. thick, forming a floor with a total width of 7 ft. 4.5 in., from which the operating apparatus of the intake is manipulated. The floating log boom has been omitted and the controlling gates that were provided in the original design on the openings beneath the curtain wall between the piers have been replaced by a vertical sheathing of 8 x 8-in. horizontal stop logs on the upstream face of the curtain wall and piers, as shown in one of the illustrations. These stop logs are held in place at each end in vertical channels built up of angles and structural shapes and attached to angles anchored in the concrete of the piers. The ends of the stop logs are cut to fit the vertical channels and are fitted with U-shaped hook-bolts which facilitate their removal from the channels. Chains attached to the ends of the bottom stop log of

The Intake Structure from the Upstream Side Showing Stop-Log Guides.

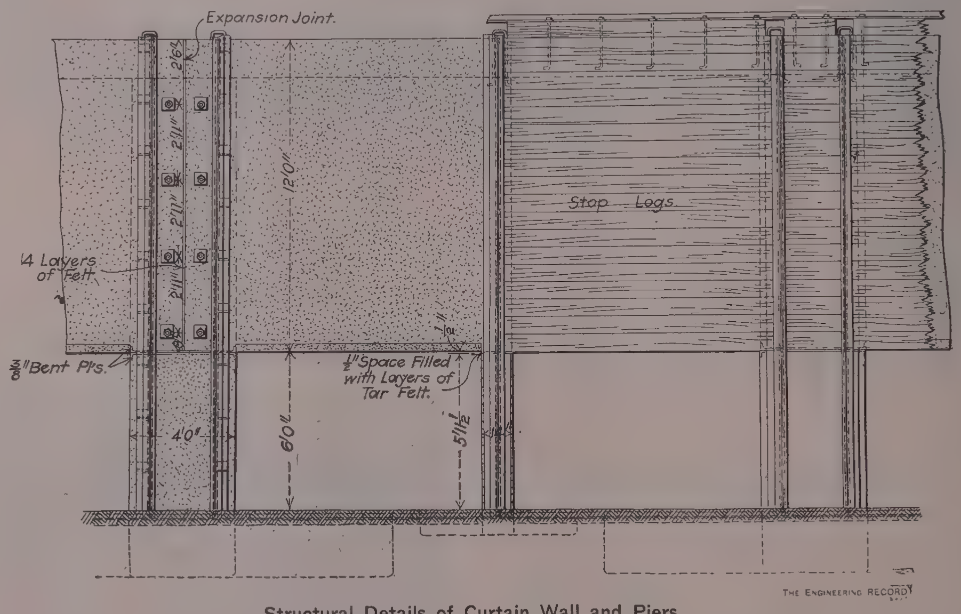
each group pass up through the slots in the ends of the superimposed stop logs, and, being fastened in chocks formed by slotting the tops of the channels, support the whole group of logs at any point. The logs will be handled by a traveling hoist on a light runway track laid on the operating floor, the intention being to arrange the openings under the curtain walls so they may be, in case of necessity, closed completely by the stop logs, although no contingency is at present recognized that will require such complete closure. The stop logs will be used, however, for controlling the flow into the outer forebay by varying the amount of openings in the curtain wall which they cover.







Intermediate Pier



Structural Details of Curtain Wall and Piers.

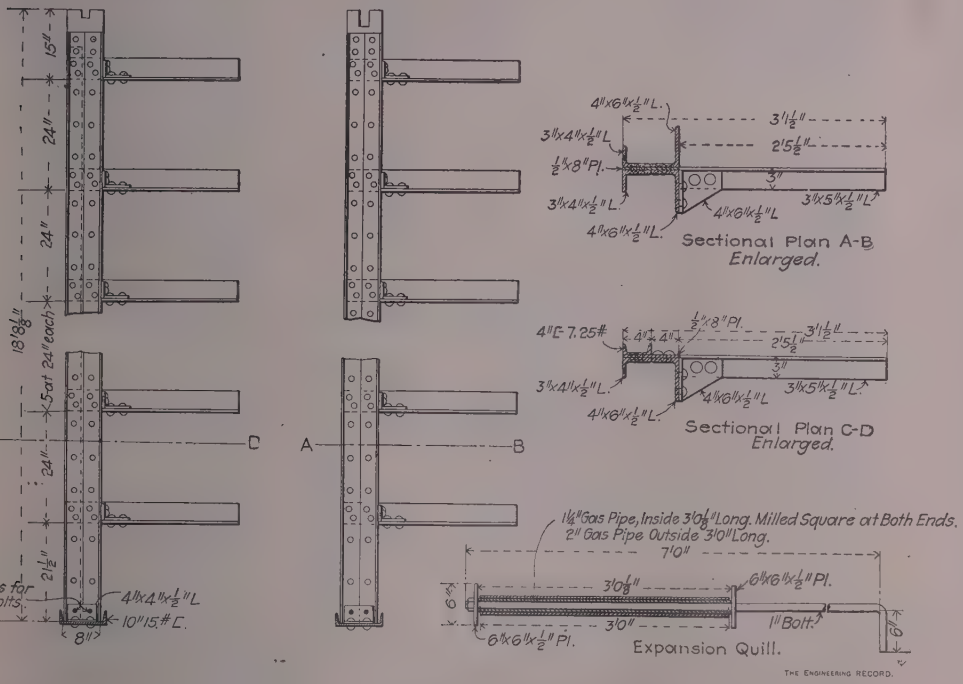
The chosen location of the intake and the depth to which the curtain wall is submerged were adopted to set up a strong transverse current along the curtain wall at the water surface, preventing accumulation of the floating ice with which the river is heavily charged during parts of each winter, and at the same time preventing water from being drawn through the intake from the surface of the river. Such ice and floating debris that do enter the outer forebay by diving under the curtain wall will be largely carried away over the spillways at the end of the confining wall near the screen house.

The arrangement of the reinforcement in the curtain wall, floor slab and intermediate piers is shown in the accompanying illustrations. The main piers are monolithic and are founded on the solid rock of the channel bottom. They are built in conjunction at the down-stream end with transverse reinforced-concrete thrust anchorages, 2 ft. 6 in. deep, 5 ft. wide and 16 ft. long, imbedded in the rock. They are additionally anchored by eight 1½-in. Johnson corrugated bars, 6 ft. long, imbedded 4 ft. in the rock in two longitudinal rows, one 1 ft. on each side of the longitudinal center line of the pier. The thrust anchorages are intended to counteract the tendency of the piers and curtains to slide down stream, due to water pressure against the face of the curtain; the anchor rods serve partially for this, but primarily to resist any tendency of the structure to overturn about the toe. The small intermediate piers are anchored to the concrete in a similar manner and divide the 6 x 20-ft. opening below the curtain wall between the main piers.

The reinforced-concrete curtain wall and the operating floor slab are built with vertical expansion joints consisting of complete parting planes at each alternate main pier, with four layers of tarred felt in the joints between the adjacent sections. The curtain is also separated from the main piers at which expansion joints occur and where it rests on them, by a single layer of tarred paper and from the intermediate piers where the curtain wall rests on them by four layers of tarred felt. The curtain wall is held in place against the main piers at the expansion joints by eight 1-in. bolts, 7 ft. 6 in. long, in two vertical rows, one on each side of the joint. The bolts pass through 6 x 6 x ½-in. washers on the face of the concrete, then through 1¼ pipe sleeves inclosed in 2-in. gas pipes imbedded in the curtain wall and are anchored in the concrete of the piers. The end of each section of the curtain wall at the expansion joint is shod with a ⅜-in. by 3 x 4-ft. plate which bears on a ⅜-in. by 2 x 3-ft. bearing plate on the pier.

The construction of the intake was carried on in the dry, a large rock-filled timber crib and cofferdam being built partially around the site so as to deflect the river currents. The arrangement of the expansion joints with parting planes in three directions, the parting planes in two directions at the other main piers, the imbedding of the structural shapes which form the stop-log channels and the setting of the reinforcement in the curtain wall and operating platform complicated the building and erection of the forming and required unusually careful placing of the concrete.

The solid rock bed of the river forms the foundation of the structure and was first excavated to the level of the forebay floor, then the excavation was made for the piers, thrust anchorages and anchor rods. A complete concrete mixing plant was set up at each end close to the site of the end piers and at the level of the forebay floor. Both plants were arranged in practically the same manner and consisted of a Smith mixer with an elevated platform above it on which the sand and broken stone were delivered from separate hoppers provided for them. The concrete materials were delivered to the mixer from measuring boxes on the platform and the concrete discharged from the mixer into a bottom-dump Cyclopean bucket, which was elevated by a stiff-leg derrick and dumped into a hopper above the level of the operating floor of the intake and at the end of the structure. The concrete was discharged from this elevated hopper through a chute into two-wheel concrete buggies, with a capacity of 8 cu. ft. each, and hauled to place on runways along the top of the forms. The elevated hoppers and mixing plants were not moved from their first locations, and with the maximum haul from the hopper of 298 ft., the contractor, The Reinforced Cement Construction Co., of New York, does not consider that the rate of laying was less rapid than with the shorter hauls.



Stop-Log Guides and Expansion Quill in Curtain Wall.

The concrete was mixed very wet in the proportions of 1 of Lehigh Portland cement, 3 of sand and 5 of broken stone. The cement was tested according to the standard tests suggested by the American Society of Civil Engineers. The sand was obtained from a bank close at hand, and although it contained a considerable amount of loam, tests of briquettes made of different proportions of mortar in which it was used showed greater strength at various ages than is credited to briquettes made with the standard sand suggested by the American Society of Civil Engineers. The limestone excavated from the floor of the forebay was crushed in a Gates rock crusher, and the run of the crusher was used after the dust has been screened out. All pieces which would pass a 2-in. ring were used, except in the curtain wall, intermediate piers and platform, where the maximum size stones were 1 in. The proportions of the concrete were varied to suit the different locations and when there was not sufficient fine material in the crushed rock to make the proper proportions, the deficiency was made up with sand. The concrete was well tamped into place around the reinforcement rods and the imbedded structural shapes, while along the forms the stone was worked away from the surface with flat spades. The appearance of the concrete as it came from the forms may be seen in the accompanying illustrations.

The intake structure between the abutments contains 1,846 cu. yd. of concrete, or a little more than 3 cu. yd. per linear foot. This was placed in 34 working days of 10 hr. each, of which 6 were rainy and 2 were holidays, by a gang of 30 men, half of the forms being erected during the same time. Hungarian laborers were employed on the concrete work, but the forms were built and erected by the best skilled labor obtainable.

The intake structure was designed by the Niagara Construction Co., Ltd., of which Messrs. L. L. and P. N. Nunn are engineers, and Mr. O. B. Suhr is engineer in charge. The contractors for this work and the reinforced-concrete construction on the remainder of the headworks was the Reinforced Cement Construction Co., of New York.

The New Turbine Cunarder Steamships, now under construction in England, will be the largest and most heavily powered vessels ever built. They will both have the following dimensions: Length over all, 800 ft.; beam, 88 ft.; depth, 60 ft.; displacement, 43,000 tons; total horse power, 71,000, and speed, 25 knots per hour. They will be the first of modern ships to exceed in dimension of beam the standard set by the famous old Great Eastern, while exceeding the latter in length by 108 ft. Owing to their extreme height, corresponding to an 8-story office building, it has been decided to introduce elevators for communication between decks. Four turbines and propellers will be used, each of about 18,000 hp. capacity, while the boiler capacity to the extent of 75,000 hp. will be installed.

The Peat Fuel Industry in Michigan.

The manufacture of peat briquettes for fuel is assuming proportions of considerable magnitude in parts of Michigan. Four plants of large capacity are in course of construction or completed, whose product will eventually, it is thought, have a marked effect on the fuel supply in sections of that State. Large quantities of the new fuel have already been manufactured and sold, and its use is said to have proved satisfactory as a substitute for anthracite coal for domestic purposes. While it can be produced at these plants at a total cost considerably less than that of the anthracite, it commands nearly as high a selling price, owing to its cleanliness in handling and absence of ash in burning.

The four plants are located at Chelsea, Bancroft, Caro and Eaton Rapids. The first three are designed to handle the peat or "muck" in a dry state. It is hauled first to racks where it is air-dried under cover until the moisture is reduced from 80 to 90 per cent. to less than 40 per cent. It is then the general practice to grind and screen the material before it enters the briquetting presses, although at Chelsea the material is kiln-dried and ground a second time before pressing.

The Eaton Rapids plant of the Michigan Peat Co. will, however, make use of a wet handling process which is interesting. A large dredge is being constructed which will float in the lake formed by the removal of the peat and gather the material by an orange-peel bucket for delivery to a shredder located on the scow. The shredded peat will then be delivered to the factory about a mile distant by flushing it with water down an elevated chute inclined toward the receiving pit. All the drying will be accomplished by partially pressing and then kiln-drying the material before it enters the briquetting presses.

The Eaton Rapids plant is probably the largest and most elaborate of any that have been attempted in this country, involving an expenditure for plant and equipment, it is claimed, of nearly $250,000. The power for operation is to be generated and distributed, electrically, by the use of the two-phase alternating-current system. The factory buildings are of concrete and everything is apparently of a permanent character. The dredge scow is 40 x 90 ft. in size and is to be operated electrically by a transmission line from the power plant.

A notable feature of the finished product of all of the plants is its entire cleanliness in handling. In the briquetting process the binder and peat are subject to a pressure usually reaching about 10 tons per square inch which gives the briquettes a hard, dense structure without the dirty properties of ordinary coal. It is also found to weigh practically the same as anthracite coal for equivalent bulks, and its heat value is said to be nearly the same as the best anthracite.

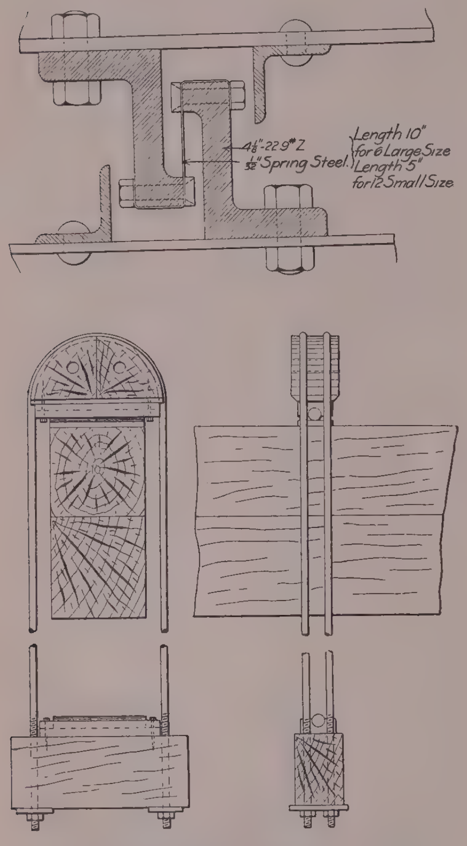
The different companies make varying claims as to the cost of manufacturing the briquettes ready for shipment, ranging from 50 cents to $1.50 per ton, while the retailing price has been from $3.50 to $5, delivered at local points. The plant at Chelsea, of the National Peat Fuel Co., has a capacity of 30 tons per day, the work being handled by four men and with a power expenditure of about 30 h.-p.

Tests of Cylinder Oils made by exposing them for 4 hours in thin films to the action of steady currents of air at 212° and 400° Fahr. are reported by Messrs. F. W. Richardson and H. N. Hanson, in the "Journal" of the Society of Chemical Industry, to be more reliable than mechanical tests. The action of superheated steam on a drying oil is similar to that of hot air, it is stated, although less rapid, so that the oxidizing of an oil in a current of hot air tests its gumming properties.

A Large Hydraulic Testing Machine for Uniform Loads.

Engineers interested in the properties of concrete and reinforced concrete have been aware for some time of the valuable tests of full-size beams which Mr. Robert A. Cummings, M. Am. Soc. C. E., has been making near Pittsburg. For these tests he built a special machine in 1903, which was capable of applying a uniform load of 500 lb. per linear foot to freely supported beams. In the design and construction of the machine a number of special problems arose, not only owing to the temporary character of the apparatus, but also on account of the high degree of precision desired in the tests. From a paper on the machine recently read before the American Society for Testing Materials by Mr. Cummings and other data supplied by him, the following notes have been prepared:

Hydraulic power was selected as the most practical for obtaining the large load requisite for the tests. It was decided that the best method for the distribution of the applied load was by means of a series of beams arranged as shown in the accompanying illustrations. Short lengths of I-beams were spaced along the specimen beam, the points of application of the load being 12 in. apart longitudinally. Above the shorter lengths of I-beams were arranged longer beams, the supported end of each one resting upon the center of two of the shorter, and above these again were still larger beams similarly arranged. This method afforded uniform distribution of load over the specimen under test. The various specimens tested were 10 x 18 in. in cross section, the spans varying from 8 to 20 ft.



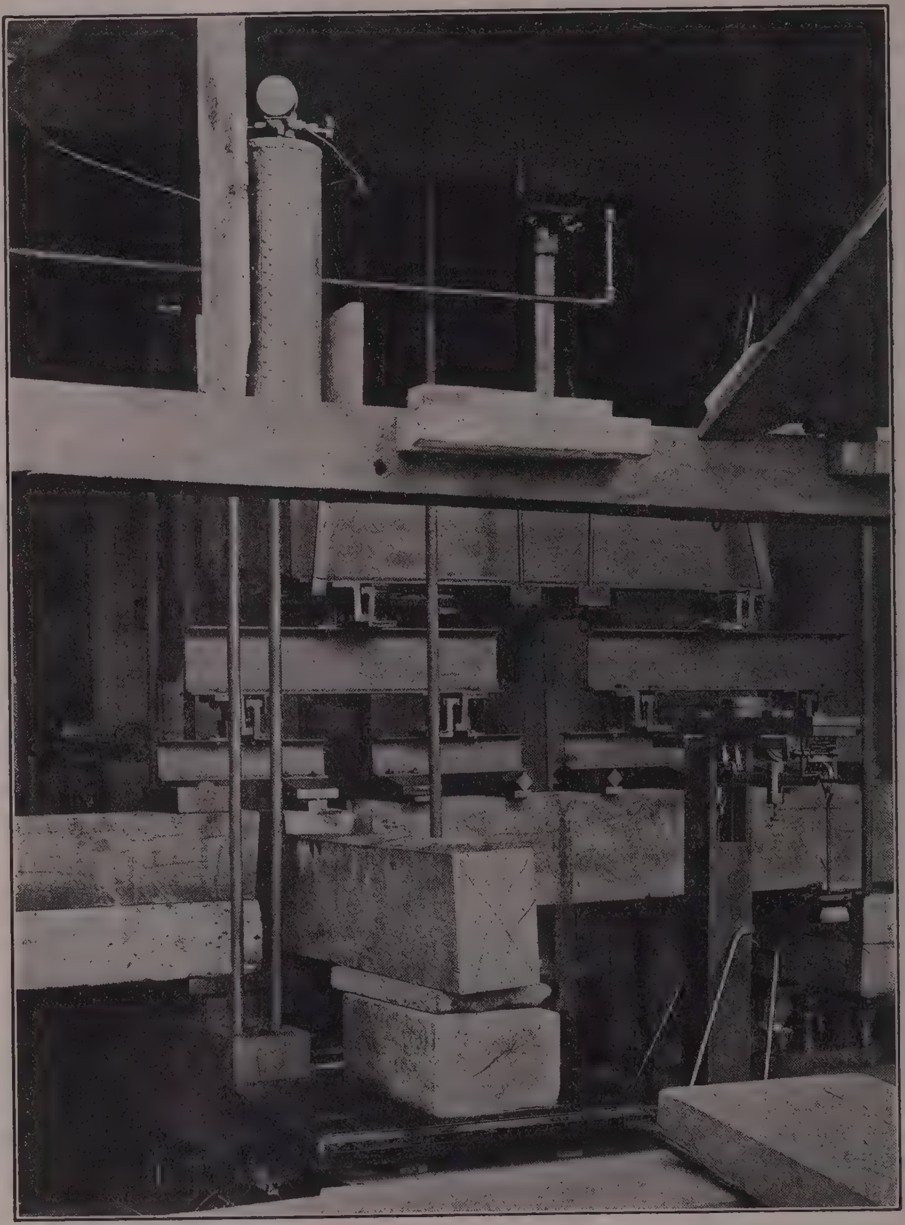
Details of Flexible Connections and Slings.

It was assumed that the maximum deflection producing failure of the specimen would not exceed 2 in. A large scale diagram of the distribution beams was made to show the distortion of the loading with this deflection at the center. The curve of assumed deflections of specimen was plotted as a parabola and the outlines of the lower beams laid off at right angles to a tangent to the parabola at the points of application of the loads. The maximum horizontal movement was found to be in the upper beam and amounted to one-half of the assumed deflection of the specimens. The movements of the lower tier and hydraulic jack were inappreciable. This diagram was found quite useful in designing the details. The machine was "home-made," with the exception of the hydraulic apparatus, which was loaned by Mr. F. H. Stillman, of the Watson-Stillman Co., makers of hydraulic appliances, New York.

The machine rests on three 12 x 12-in. longitudinal timbers 3 ft. 9 in. apart on centers. These sticks support two 6 x 12-in. transverse sills, 21 ft. apart in the clear, into which are morticed the feet of the 6 x 12-in. timbers forming the A frames at each end. A 16 x 4-in. timber is bolted near the top of each frame to help support the two 16 x 16-in. timbers forming the top beam. The beam to be tested is supported from this compound beam by means of slings, as shown in one of the detail drawings.

One of the most interesting features of the machine is the flexible connection used between the systems of equalizing beams. It is essential in any such apparatus to have these connections free to follow the deflection without interfering with the distribution of the load, an aim which seems to be fully attained by the joint illustrated in the accompanying sketch.

The load was applied by the lower system of equalizing beams through the medium of two kinds of knife edges. Under one end of each beam was a fixed ⅝-in. triangular bar of steel with its lowest edge rounded to a 1/16-in. radius. This rounded edge rested in a slight groove in a ½ x 2 x 12-in. bar laid across the top surface of the beam to be tested. Under the other end of the equalizing beam was a 1½-in. square steel bar, placed with one edge against the bottom flange of the beam and the edge diametrically opposite in a groove in a ¾ x 2 x 12-in. plate on top of the test beam.

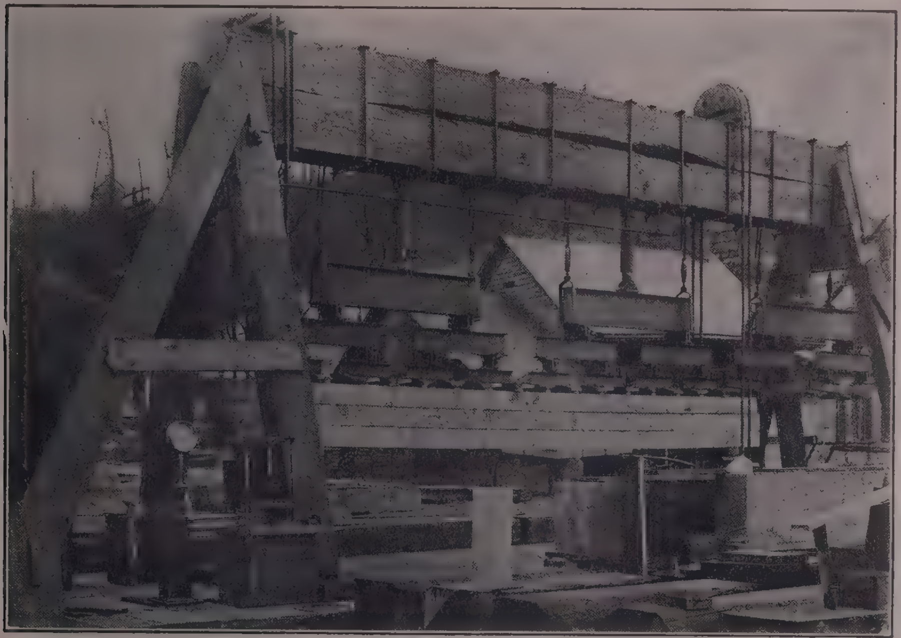


Method of Calibrating the Testing Machine.

The operation of the testing machine required two observers, also a recorder and two handymen and the use of a steam derrick for moving the beams. When making a test, the beam was placed in position, with the observers stationed on either side to read the extensometers and deflectometer. They announced the observed action of the beam to the recorder who entered the result on the prepared blanks. One handyman operated the hydraulic force pump and another applied the weights as required on the spinning accumulator gauge. The application of load could thus be made at any rate of speed or repeated as often as needed. This feature of a hydraulic apparatus was especially useful for repetitive tests and obtaining permanent set and the effect of speed in loading.

The spinning accumulator gauge was calibrated and checked with a dial for pressure up to 1,000 lb. per square inch. For pressure above 1,000 lb. and up to 5,000 lb., the maximum capacity of the machine, the spinning accumulator gauge was used alone. A light oil instead of water was used for the hydraulic apparatus to avoid danger from freezing. On the completion of a test the handymen replaced the tested specimen with an untested one. It required about one-half day to make a complete test of each specimen and to place another in position, usually two tests were completed in one day.

In calibrating the machine to get the actual applied load, two weighing machines, with platform scales, were placed on either side of the testing machine and supported the ends of a beam, as shown in one of the illustrations. This beam transmitted the total load received at points of application which was weighed with both scales and recorded. Several tests were made; some of these were with 50-lb. increments per half minute, and others with 100-lb. increments at 1 and 2-minute intervals. These tests were taken up to 5,000 lb. per square inch of the machine. The actual weight shown by the scales at each interval was recorded. Upon reaching the limit of the machine the load was released in a manner similar to its application. As a result of the application of loading at varying rates of speed, it was determined that increments of 100 lb. per minute were most convenient, and secured the most uniform results.



General View of the Testing Machine.

The actual applied loads were plotted and the resulting curves show that in every test, upon running up the load, the actual exceeded the computed weight, and in releasing this was reversed, probably due to internal friction of the hydraulic jacks. When the load was retained at 5,000 lb. for eight minutes, there was a falling off of pressure as one might expect.

The results of the tests made with this machine are not available for publication, but Mr. Cummings is willing to furnish them for use in any really scientific research work.

A Recent Panama Canal Requisition from the army medical department called for 38 tons of insect powder, 20 tons of sulphur and 100 iron pots in which to burn it, together with 15 tons of newspapers, which are to be used by the government in the fumigation of the buildings of the Isthmus.

Book Notes.

"The Pollution of Lake Champlain" is the title of a report by Mr. M. O. Leighton, which the U. S. Geological Survey has just published in its series of water supply and irrigation papers. The subject has been attracting much local attention for several years, for while the lake has ceased to be of much account as a transportation route, it is becoming lined with the homes of summer residents attracted by its beauty and will eventually have much importance as a source of water supply. The pollution of the water which has given rise to controversy has been due to the sewage of the towns on its shores and to the waste liquors from pulp mills. The pamphlet contains the report of a rather hasty inspection of the principal sources of pollution, only one of which is regarded as of any present importance. This is the sewage of Burlington, Vt., which seriously contaminates the water supply of that city. The water of the main lake is of good quality and the waste liquors from the pulp mills affect it only locally. The report is of particular interest, as indicating the manner of carrying on investigations of this nature, a subject about which little has been written in a form of much usefulness for engineers. It also gives some valuable data concerning the effect of the discharge of pulp mill wastes on the waters in the immediate vicinity of the points of discharge.

A small volume on painting structural steel has been written by Mr. Houston Lowe, and published at 50 cents by the D. Van Nostrand Co., New York. It is entitled "Hints on Painting Steel," but it also contains many notes on the leading materials used in paint. The author is frankly a paint maker, and the book aims to establish the following proposition: "We work upon the hypothesis that the solids are coefficient with the liquids in producing the best materials, and that the secret, if there be any, lies in the proper adjustment or determination of the amount and kind of each needed to secure a perfect product." The author lays special stress on having a clean surface for the paint and on the importance of the priming coat. The method of application is as important, he says, as the quality of the paint, while the best paint for any particular service can only be prepared when the maker is fully informed concerning the conditions of the service. While parts of the book run counter to the opinions of some makers and large users of paint, there is a large amount of practical information with which everybody is in accord.

One of the most serious problems with which the city of Rochester, N. Y., has to deal is the prevention of floods in the Genesee River, which flows through the place. The dangers to which business interests were exposed from this cause several times in the last ten years led the Mayor to appoint a number of engineers as a special committee to report on the flood conditions. This document has just been published with a number of maps and illustrations, and forms a useful contribution to the history of river floods. The committee, consisting of Messrs. E. A. Fisher, T. W. Finucane, G. W. Rafter, Houston Barnard and J. Y. McClintock, collected data concerning floods and river conditions influencing them, running back to the early days when Rochester was little more than a hamlet of pioneers. The value of this historical record can only be appreciated by those who have made a serious attempt to study the flood problem of a large stream. The solution does not depend on past conditions, but on those of the present and the future, yet from the changes that have taken place in consequence of altering the character of the catchment basin and varying the riparian conditions, it is possible to gain some idea of the causes producing alterations in the flood character of the stream. The attention of instructors in technical colleges is called particularly to one of the illustrations showing the water piling up against the cutwaters of the piers of a masonry bridge having arch spans wide enough to prevent any appreciable damming of the river as a whole. The rise in the water is accordingly due to the velocity head of the river, and the picture illustrates vividly the physical meaning of a term that students sometimes have some difficulty in comprehending.

Notes on Hydrology. By Prof. Daniel W. Mead. Madison, Wis., published by the Author; cloth, 224 pp., many illustrations.

Prof. Mead is well known among engineers for his interest in hydrology, and is the author of a number of valuable papers on different branches of the subject. In this volume he has brought together a mass of useful information in the form of tables and diagrams, which are connected together in places by a very thin amount of text. The first chapter is a general discussion of the field of hydrology and its importance, the second explains the various properties of water, third is on hydrography and physiography, the fourth on hydrometeorology, the fifth on hydrogeology, the sixth on the physiography of the United States, the seventh on rainfall in the United States, the eighth on the disposal of rainfall, the ninth on stream flow, the tenth on ground water, the eleventh on the hydrography of ground waters, the twelfth on hydrometry, the thirteenth on ice influences, the fourteenth on the chemistry of natural waters, and the fifteenth on applied hydrology.

The value of the book to the engineer lies in the great amount of information collected from many sources which is here presented. Probably no other single volume contains such a mass of data. Apart from this feature, particular attention may be called to the chapters on the properties of water and on hydrogeology. Water is so familiar to everybody that it is natural to assume that its properties have been thoroughly investigated. As a matter of fact one of the most important fields of investigation before the Bureau of Standards is the accurate determination of these properties, for there is at present no definite precise knowledge on the subject. Prof. Mead gives the authorities for all the data he has compiled and the information is probably as good as any that can be brought together for the present. The chapter on hydrogeology is a very important one, for it is only recently that engineers have appreciated how much influence on water supply undertakings is exerted by the geology of the country in which they are carried on. This subject has been one of the author's hobbies for a long time, and he presents it in a very interesting manner.

Hydraulic Tables Showing the Loss of Head Due to the Friction of Water Flowing in Pipes, Aqueducts, Sewers, etc., and the Discharge Over Weirs. By Gardner S. Williams and Allen Hazen, New York, John Wiley & Sons; cloth, 8vo, $1.50.

The Hazen-Williams slide rule has already been described in this journal, so it is unnecessary in this place to say anything about it except that most of the tables in this book were computed with it, and the instrument is decidedly useful to those having hydraulic computation to perform. The pipe flow formula used in the rule, and consequently in the tables is

$$v = c r^{0.63} s^{0.54} 0.001^{-0.04}.$$

The exponents in the formula were selected as representing as nearly as possible average conditions, as deduced from the best available records of experiments upon the flow of water in such pipes and channels as most frequently occur in water works practice. The last term, $0.001^{-0.04}$ is a constant introduced simply to equalize the value of c with the value in other exponential formulas at a slope of 0.001 instead of at a slope of 1.00.

The tables of pipe flow cover a great range of values of c from that suitable for the small brass and wrought iron pipe sizes up to the largest cast-iron mains and masonry aqueducts. Special attention is deserved by the excellent arrangement of data of results of experimental gaugings and of the effect of age on the discharge of conduits. The formula is equally applicable to open channels, and there are some well-arranged data showing the closeness with which it approaches the results of careful tests. The discharge of brick and tile sewers and some valuable information concerning the underdrains of water filters are also given among the tables.

The section of the book on the discharge over weirs is probably the best short article on the subject available at the present time. It gives not only tables and definite statements concerning the applicability of the three best-known weir formulas, but also has diagrams and tables of other forms of weir than the knife edge plate. This information is particularly useful in connection with estimates of the discharging capacity of waste weirs.

It might be added for those who are not acquainted with the Hazen-Williams formula, that it was discussed in a thorough manner in this journal on June 20, 1903, by Mr. Leonard Metcalf, who showed graphically the relations of a large number of such formulas to each other. He also gave a number of diagrams for using the formula in practical work, but as there are many people who prefer tables to the slide rule or to diagrams, this book will doubtless have a wide circulation. It has the advantage of being readily used and can be employed readily in checking results obtained in other ways, as well as for original computations.

Miniature Roof Protections for Pole Line Insulators have become a necessity upon the high-potential transmission lines in California. The natural deposition of moisture upon them in fogs, or of dust in dry weather, is apt to cause escape of the current and eventual short-circuits resulting in burning and often destroying the pole. This is now provided against by sheltering all insulaors by V-shaped boxes or sheds.

Letters to the Editors.

Low-Pulling Early-Stage Cement.

Sir:—Referring to article by Mr. Bernard Enright in your issue of July 29th, criticizing the conclusions drawn in my paper on "low-pulling early-stage Portland cements," recently submitted to the Atlantic City convention of the American Society for Testing Materials.

Mr. Enright has failed to notice, or at least give proper weight, to my remark, when comparing results as given in the table of records, on "rejected" material, that this was a very small percentage of the whole quantity tested, as well as to my further conclusion that these results would indicate the possibly satisfactory determination of the acceptability of any cement, other things being normal, on its low strength at early period irrespective of any specified gain.

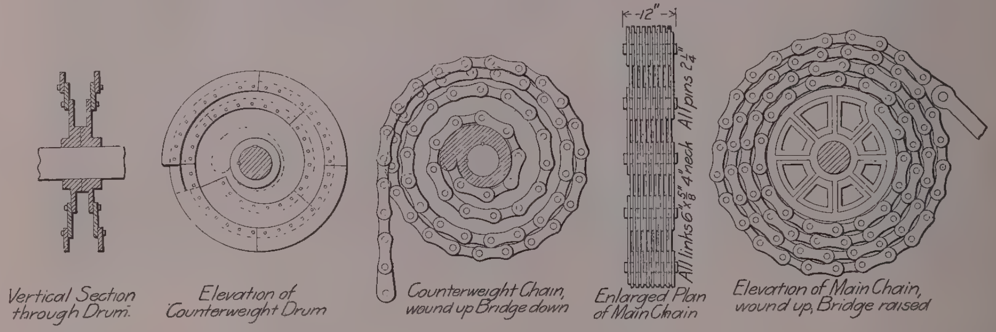
As the contracting manufacturer and myself have always agreed, its entirely likely that some good cement, possibly the small percentage herein referred to, may have been rejected, while it is safe to say no bad cement has gone into our construction. I am entirely satisfied that our ruling requiring a minimum gain is the best guide for action at twenty-eight days.

Very truly yours, W. A. Aiken.
General Inspector of Material.
Bethlehem, Aug. 4.

Testing Concrete Slabs.

Sir:—In your issue of July 22 is found a photo-reproduction, also an account of the testing of a concrete slab. Engineering and reinforced concrete literature abounds in accounts of similar tests, all pointing to the great strength of reinforced concrete. No doubt many engineers have wondered why the concrete slab has been given the credit for sustaining the load. Why, in this case, do not the steel billets act as a beam, or rather a series of beams, and carry the load to the abutments. The second and fourth layer of the billets certainly are more to be relied upon than the concrete slab for carrying the load. It would be interesting to know what the result would have been had the four lower outside billets been omitted. Indeed, as soon as the I-beam supports were spread beyond the end of the billets, the inevitable occurred.

Engineer.


Vertical Section through Drum.
Elevation of Counterweight Drum
Counterweight Chain, wound up Bridge down
12"
All links 6"×5/8" 4" neck All pins 2 1/4"
Enlarged Plan of Main Chain
Elevation of Main Chain, wound up, Bridge raised

Details and Arrangement of Drum and Chain.

Sir:—In the article entitled "Test of Concrete Bridge Floors" appearing in The Engineering Record for July 22, 1905, the author states that the slab in question carried a load of 46,875 lb., or 3,750 lb. per square foot on a 3 ft. 7-in. span and failed to collapse. From the accompanying illustration it is difficult to see how the method of loading used subjected the slab to any uniformly distributed load whatever. In other words, why did not the slab, on deflecting slightly, at once relieve itself of nearly all load, allowing the second layer of billets from the bottom acting as a beam, to carry the entire superimposed load to the two outer billets of the first layer, the latter being almost directly over the supports?

George D. Huntington.
Watertown, N. Y., July 25.

[These criticisms rest on just grounds, for tests made in the manner indicated are certainly indefinite in their indications. The test would have been better as respects accuracy, had three or four layers of billets been loaded in the same direction, wiring them together if necessary to keep them from falling. Then the cross layers could have been used thereafter at intervals and a more uniform load obtained. At the same time these billets vary in thickness and there was probably a fairly uniform load until the slab deflected sufficiently to overcome all irregularities of the billets and to throw the weight mainly on the two end billets. These end billets were within the supports. There can be no doubt that the slab received a very heavy load before it deflected, but at the same time the method of piling was manifestly favorable for the slab.—Editor.]

Counterbalancing Bascules by Chained Weights.

Sir:—In your issue of July 29th you print a communication from Mr. John Hawkesworth, C. E., describing a method of counterbalancing bascules by means of attached separate weights, which are relieved one by one as the weights descend, and intimating that such an arrangement might be found desirable in counterbalancing bascule bridges. Such an arrangement was proposed by Mr. Geo. H. Thomson, and is covered by a patent issued to him in 1893. The writer has proposed a method of counterbalancing bascule bridges, which may be of interest in connection with other problems besides bridges.

The method consists essentially in connecting the moving span with a drum at the top of a tower by means of chains built up of flat links, which wind up on themselves as the bridge rises. The counterweight is connected with a drum, which is mounted on the same shaft as the drum above referred to, by means of similar chains which unwind from upon themselves as the bridge rises. In this way it is possible to nearly balance the opening span, but if perfect balance be desired, it is necessary to construct a drum which supports the counterweight chains by the sides. These chains have been used with great success in ore-unloading machinery on the Great Lakes, and have proved that they will work perfectly under conditions such as this.

This arrangement has great value in places where the counterweight can be given a long run, as the initial radius of the counterweight drums can be made larger than that of the other drums and thus balance the bridge by means of a counterweight weighing less than would otherwise be required. I enclose sketch showing details of drums and chains which have been worked out for a 160-ft. single track railway bridge.

Yours very truly, Wilbur J. Watson,
Cleveland, Aug. 1. M. Am. Soc. C.E.

CURRENT NEWS SUPPLEMENT

AUGUST 12, 1905.

DIRECTORY OF NATIONAL TECHNICAL AND TRADE SOCIETIES.

American Society of Civil Engineers, Secretary, Chas. Warren Hunt, 220 West 57th St., New York.

American Society of Mechanical Engineers. Secretary, F. R. Hutton, 12 West 31st St., New York.

American Institute of Electrical Engineers. Secretary, Ralph W. Pope, 95 Liberty St., New York.

National Fire Protection Association. Secretary, W. H. Merrill, Jr., Chicago.

American Institute of Mining Engineers. Secretary, R. W. Raymond, 99 John St., New York.

American Institute of Architects. Secretary, Glenn Brown, Washington, D. C.

Association of Engineering Societies. Secretary Frederick Brooks, 31 Milk Street, Boston, Mass.

American Society of Heating and Ventilating Engineers. Secretary, W. M. Mackay, 235 Water St., New York.

Canadian Society of Civil Engineers. Secretary, Clement H. McLeod, 877 Dorchester St., Montreal.

Society for the Promotion of Engineering Education. Secretary, Prof. M. S. Ketchum, University of Colorado, Boulder, Colo.

American Society for Testing Materials. Secretary, Prof. Edgar Marburg, University of Pennsylvania, Philadelphia, Pa.

American Society of Municipal Improvements. Secretary, George W. Tillson, Room 12, Municipal Building, Brooklyn, N. Y. Annual meeting, Sept. 5-9, Montreal.

Association of Railway Superintendents of Bridges and Buildings. Secretary, S. F. Paterson, Concord, N. H.

American Railway Engineering and Maintenance of Way Association. Secretary, L. C. Fritch, 1562 Monadnock Block, Chicago.

American Water-Works Association. Secretary, J. M. Diven, Charleston, S. C.

American Foundrymen's Association. Secretary, Richard Moldenke, P. O. Box 432, New York.

Engine Builders' Association of the United States. Secretary, J. L. Lyle, 39 Cortlandt St., New York.

American Public Works Association. Secretary, W. H. Flint, Chattanooga. Annual meeting, Chattanooga, Aug. 30-31. Postponed until further notice.

Association of American Portland Cement Manufacturers. President, J. B. Lober, 1232 Land Title Building, Philadelphia.

THE FIFTIETH ANNIVERSARY OF THE CRANE CO.

Last month the Crane Co., of Chicago, had an elaborate celebration of its fiftieth anniversary. The founder of the company, Mr. R. T. Crane, took the first heat from a little brass furnace on July 4, 1855. This furnace was in a corner of the lumber yard of his uncle, the late Martin Ryerson, and from it has developed one of the leading industries of Chicago. A foot lathe was bought pretty soon and business developed so well that in about a year a three-story building was put up, and pipe fitting and steam heating were undertaken.

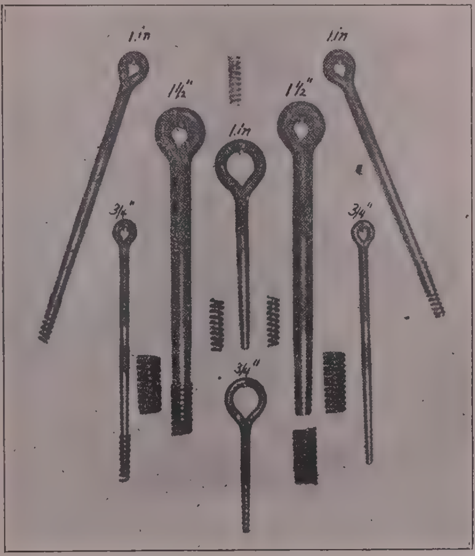
Little business was done in the three years previous to the breaking out of the Civil War because of the unsettled conditions prevailing. After the breaking out of hostilities the enormous demand of the government for all sorts of material created a boom in business generally. The brass plant had to be enlarged, and the manufacture of brass globe valves, check valves, steam and gas cocks begun. An iron foundry was started. and the building, in a small way, of machinery and making of a few articles belonging to the steam fitting line was undertaken. About the same time a small butt-weld pipe mill, the first west of Pittsburg, was built on ground where the Crane Company still has a pipe mill. In the same year, 1864, the property where the present brass department is located was purchased and the first malleable iron foundry outside of the Eastern States started. This foundry was on the second floor and is said to be the first instance of a foundry being placed above the ground floor. The manufacture of both malleable and cast-iron fittings was commenced.

In 1865 the business was incorporated by Richard T. Crane, Charles S. Crane, Martin Ryerson, Eliphalet W. Blatchford, Charles N. Holden and the name changed from R. T. Crane & Brother to the North Western Manufacturing Co. This name was retained until 1872 when the title Crane Brothers Manufacturing Company was adopted, which was changed in 1890 to Crane Company.

By 1870 the business had grown so that further extensions were necessary. In 1881 another pipe mill was built, and one lap-weld and two butt-weld furnaces were erected. In this mill a Siemens gas furnace was employed in the manufacture of lap-weld pipe. Some years later the machinery in this mill was sold to another concern, and the mill was then rebuilt, the malleable iron and grey iron fitting departments being transferred to it, leaving larger space in the old buildings for the brass shop.

As early as 1857 the company entered the steam warming field, and the next year had a contract for the steam warming of the court house at Chicago. At different times the company manufactured heating coils, wrought iron pipe radiators, cast iron radiators, and ventilating fans. Believing that it was not fair for the manufacturer to compete with the trade to which he was selling, the company retired in 1874 from the steam warming contract business.

Elevators were made by the Crane Company as early as 1867, and the business grew so rapidly that it was soon crowding other work out of the machine shop. In 1870 the manufacture of passenger elevators was commenced. In 1886 the elevator part of the business was separately incorporated as the Crane Elevator Company and given a complete plant by itself. The Crane Company and the Crane Elevator Company brought out and introduced ten different types of elevators and did much towards developing this line of machinery. With a view to concentrating on the valve and fitting business, in 1895 the Crane Elevator Company was sold. While Otis Tuft, of Boston, was the first builder of passenger elevators in this country, and was followed very closely by Otis & Co., of New York, the Crane Company took up these lines so soon after these firms that the company should be considered as a pioneer in the industry.



A GRAPPLE FOR QUARRYMEN.

The company has from its infancy constantly added to the varieties and sizes of the products manufactured. Some of the important classes of goods put on the market in more recent years have been stationary, marine and locomotive pop safety valves, drainage fittings, extra heavy brass and iron valves and fittings, hydraulic valves and fittings, ferro-steel flanged fittings and valves, ammonia fittings, steam traps, steam and oil separators, malleable and ferro-steel companion flanges, electrically and hydraulically operated and steam actuated valves, and a complete line of flat band fittings. In addition the company is prepared to turn out complete piping equipments for power plants, and has facilities for bending and threading all sizes of pipe, and screwing, welding or rolling flanges on it. All told, the company manufactures in excess of 10,000 articles for use in connection with steam, water, gas or air.

Richard Teller Crane, the founder of the company, was born in Paterson, N. J., May 15, 1832. The family being too poor to give the children much of a school education, they went to work at an early age. But Mr. Crane's practical education—taking education to mean that which prepares a person for his life work—was peculiarly adapted to that end. After having for six years done other work, Mr. Crane, in 1847, began work in John Benson's brass shop, Brooklyn, where he spent two years in the foundry and a like period in the finishing department. Then, feeling that the brass business was not exactly to his liking, he went to New York City, where he obtained employment in the machine shops of the Taylor Printing Press Works, and later in the shops of Hoe & Co.

As a result of the business depression of 1854 Mr. Crane was thrown out of employment. Being unable to secure a new position, he decided to go to Chicago, where his uncle, the late Martin Ryerson, was engaged in the lumber business. Although he had no business acquaintances except his uncle, as before stated, and no knowledge of business methods, nevertheless, he opened the small brass shop. His policy from the first was to put his earnings back into the business, and he had sufficient courage to extend the business as rapidly as his means permitted. The panics of 1857 and 1865 found the company in a greatly expanded condition, and an exceedingly severe struggle was necessary in each case to weather the storm. By 1873 the company had gained such financial strength that the panic of that year, as well as the later panic of 1893, was passed without the business being seriously threatened. Although the company started without resources, and the business has been extended and many financial difficulties encountered, never, during the fifty years, has the company's paper gone to protest.

Mr. Crane has always taken a lively interest in the welfare of his employees. Prior to the establishment of a pension system by the Crane Company, Mr. Crane personally pensioned employes whom sickness or old age had overtaken without their having been able to lay by enough to support themselves and their families. Through the Crane Company, in 1899, Mr. Crane gave to each employe five per cent of the total amount the employe has earned during the previous year, as a New Year's present. This has been the practice each year since, except that last year and the year before the amount was ten per cent, instead of five.

In September, 1892, Mr. Crane equipped a manual training room in one of the Chicago grade schools, and employed a special teacher to give instruction in woodwork in the higher grades of several of the schools. In 1900, recognizing the success of his first experiment, he provided the necessary means for making possible manual training in the lower grades. This year Mr. Crane has provided twenty-four scholarships, of $300 each per year, to enable young men to prepare themselves as teachers of manual training, and has provided the funds for opening manual training departments in five more grade schools. In recognition of Mr. Crane's interest in the public school system, the Chicago Board of Education has recently named a new school The R. T. Crane Manual Training High School.

A NEW GRAPPLE FOR STONEWORKERS.

A new device for raising stone or other hard material in which a hole can be drilled has been developed by Mr. Harvey Farrington, 45 Broadway, New York. It is a rod threaded in a special manner at one end and provided with an eye at the other, to which the derrick rope can be attached. In using the device a hole is drilled in the block of stone and a wire coil dropped into it. The threaded end of the rod is then inserted and screwed until the coil of wire is pressed out against the side of the hole with sufficient force to unable the block to be lifted by hauling up on the eye at the end of the rod. The device depends for its action on the expansive effect of revolving a tapered screw in a coil of wire, the expansive effect of forcing a coil of wire up the special inclined surfaces of the threads, the expansive effect of contracting a coiled spring lengthwise, and the gripping due to the corrugated surface of the outside of a wire coil being forced against the wall of a hole.

Some tests of this grapple were recently made on the work on the extension of Riverside Drive in New York. A 1-in. hole was drilled 6 in. deep in a block 8 ft. 9 in. long, 4 ft. 9 in. wide and 2 ft. 6 in. thick, and a coil of No. 6 wire was inserted in it. This coil was 3½ in. long and made of 30 in. of wire. The grapple was then screwed into the coil. The block weighed 17,663 lb. and on each end of it was placed a smaller block, weighing 4,105 and 3,910 lb. respectively. The whole load of 25,678 lb. was raised a couple of feet by means of a derrick. When this had been done the eye of the bolt pulled open and the thread smoothed down, allowing the bolt to pull through the coil. By using care in selecting a coil of proper length for the weight to be lifted, the grapple can manifestly be adapted for any of the purposes to which a lewis is used, and the trouble of employing it is much less than that with the lewis.

MILLIKEN BROTHERS' STEEL MILLS.

The many rumors that Milliken Bros. were about to erect steel mills at their structural shops on Staten Island have caused that company to issue the following statement:

"This firm has now been engaged in the steel and iron business in New York City for nearly fifty years. The business has grown very rapidly in the last few years and now extends to all quarters of the globe. In order to more conveniently handle this business it has been decided to conduct it under the corporate form and under the name of Milliken Brothers, Incorporated. The new corporation of Milliken Brothers has a capital of $2,500,000, and the stock is held entirely by Edward F. Milliken and Foster Milliken, the sole owners of the present business, and no new interests are included in the new arrangement. The business in the future will be conducted the same as in the past.

"As far as the reports are concerned on the building of an open hearth steel plant and rolling mill to roll the raw material used by them, no plans have been definitely decided on, nor will any definite action be taken in connection with this matter for several months yet. Milliken Brothers, Incorporated, may decide, however, to build rolling mills for the purpose of rolling structural shapes and plates, as the necessity of doing so has become apparent to them in order to hold and control their vast export business, and their location on tide water is advantageously situated for export trade. George L. Reis, formerly general manager of the Illinois Steel Company and lately general manager of the Lackawanna Iron & Steel Company at Buffalo, and Alexander K. Hamilton, lately chief engineer of the Lackawanna Iron & Steel Company, have entered their employment.

"No association of outside interests or manufacturers is contemplated in case this proposed steel plant should be built. They are not engaged in the purchase of any additional property at Staten Island, as they already have a site more than ample for their present bridge and structural steel plant and rolling mill, should they decide to build the latter. This site is probably one of the largest in New York City, covering several hundred acres of ground, with one-third of a mile of water front. It is on the north shore of Staten Island."

THE HUDSON RIVER TUNNEL.

An accident in the Hudson River electric railway tunnel occurred August 9, which would have been trivial but for the unfortunate death of one of the workmen. The heading for the south tube is being excavated with a pneumatic shield described in The Engineering Record of July 25, 1903, and has progressed nearly to the New York side of the river at the foot of Morton St. At the time of the accident it was in a formation of soft gravel and the doors in the bulkhead were open preparatory to shoving the shield forward. The material entered more quickly and in greater volume than was anticipated and filled the end of the tunnel to a depth of about 6 ft., catching one of the men and burying him so that he was smothered before he could be extricated. The tunnel was not flooded nor was the man drowned as was stated in the daily press. No injury was sustained by the tunnel or plant, and aside from the fatality the accident was not serious or of a nature to delay the work.

BUSINESS NOTES.

The Vellumoid Paper Co. is building a new plant in Worcester, Mass., to which point it will shortly remove from East Pepperill, Mass. The main building at the new plant will be 30 x 304 ft., with an ell 24 x 64 ft., the whole one story high with basement. This company manufactures special water and grease proof papers; also a special packing for steam, water, air, etc. In addition to the regular equipment the company will install a quantity of special machinery, designed by A. C. Rice, Consulting Engineer, Worcester, Mass.

An increased demand for debris crushers by the anthracite companies is reported by the Williams Patent Crusher Co., Old Colony Bldg., Chicago. Recent sales have been made to the Pennsylvania Coal Co., to be installed at the Old Forge Colliery, Avoca, Pa.; Lehigh Valley Coal Co., Westmoreland Colliery, Wyoming, Pa.; Lehigh Valley Coal Co., Mineral Spring Colliery, Wilkes-Barre, Pa.; Lehigh Valley Coal Co., Seneca Colliery, Pittston Junction, Pa.; D. & H. Co., Wilkes-Barre, Pa.; Kingston Coal Co., Kingston, Pa. Recent sales of coal crushers have been made to Retort Coke Oven Co., Cleveland, O.; Hoover & Mason, Railway Exchange, Chicago; Utah Fuel Co., Sunnyside, Utah; Brown Hoisting Machinery Co., Cleveland, O.; Illinois Steel Co., South Chicago; Davis Colliery Co., Coalton, W. Va.; U. S. Coal & Coke Co., Gary, W. Va. Twenty-four Williams crushers have been installed at the various plants of the United States Steel Corporation and ten at the various collieries of the Lehigh Valley Coal Co.

The Brown Corliss Engine Company announces that it has secured the contract for the Corliss engine and generator for the City of Springfield, Mass.

The Ingersoll-Rand Company has taken possession of its new offices on the 14th floor of the Bowling Green Building, 11 Broadway, New York. The offices of the Ingersoll-Sergeant Drill Company, at 26 Cortlandt Street, and the Rand Drill Company, at 128 Broadway, have been given up.

Henry A. Hitner's Sons, Philadelphia, Pa., have purchased all the locomotives formerly used by the Brooklyn Rapid Transit Co. for operating their elevated lines. The engines are reported to be in good condition and will be disposed of as rapidly as possible. This company has also purchased the Perth Amboy Ship Building Co. There is at this shipyard a large tonnage of plates, angles and channels, which are for immediate sale.

The Water Works Equipment Co. has closed a contract with the city of Pittsburg, Pa., for three 30 x 30 and two 20 x 20 connections for the new filtration plant. Contract has also been closed with the city of Trenton, N. J., for one 30 x 30 and one 30 x 16 connections. This company has developed a new type of sleeve for use in connection with this work, which, it is said, will effect a great saving of lead. They have also constructed the largest tapping machine ever built. The new machine is equipped with a 16½-h.-p. Mianus gasoline engine.

The Chicago Pneumatic Tool Co. has recently issued its semi-annual statement to stockholders. The statement shows profits for the half year amounting to $413,941.54. From this amount are to be deducted $52,905.02 for depreciation of buildings, plant and machinery, repairs and renewals, etc.; $4,800 for experimenting and perfecting new lines of tools; $57,000 bond interest for the half year, and $25,000 sinking fund reserve. From the balance of $273,736.52 remaining after the above deductions will be declared quarterly dividends Nos. 9 and 10 of 1 per cent. each, which will leave $15,460.86 to be carried to surplus.

The Minneapolis Steel & Machinery Co. are at present erecting an addition to their machine shop which will consist of a one-story brick building 50 x 60. The new building will be devoted exclusively to the testing of gas engines. This company has recently taken up the manufacture of gas engines and producers. The new engine is known as the Munzel, having originated in Braunschweig, Germany, and is of the single cylinder, four-cycle type, using a magneto and make and break method of ignition. It is controlled by a throttling governor. Two of these engines have recently been sold to the city of Grand Rapids, Mich.; one to Geo. Duncan, Woonsocket, N. D., and one to the Russell Miller Milling Co., Jamestown, N. D. The company has about completed a 25-h.-p. engine, which will be delivered shortly.

The National Tube Co. has placed a large order, for immediate execution, with the American Blower Co., of Detroit. The contract embraces complete heating equipment for their five new Butt Weld Mills at Lorain.

The Independent Pneumatic Tool Co. has taken much larger space for its offices in the First National Bank Building, Chicago, in order to handle its increased business. The company reports the outlook for both foreign and domestic orders as very encouraging. Since it acquired the Aurora Automatic Machinery Co. it is able to fill promptly all orders for air drills, reaming and tapping machines, hammers, hoists and other pneumatic tools.

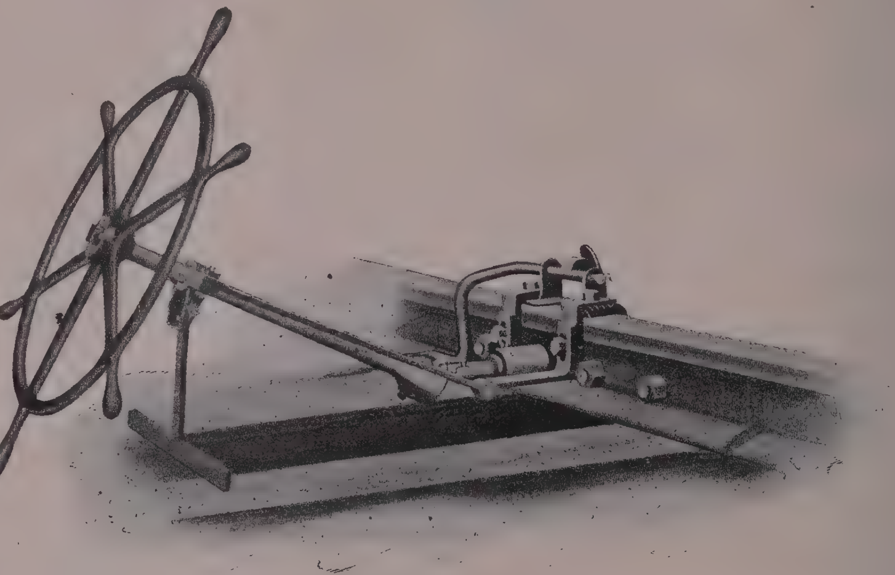
G. M. Gest, of New York and Cincinnati, subway contractor, has just been awarded a contract for the construction of an additional subway to the present system of the Cincinnati Bell Telephone Co. at Cincinnati, Ohio. The work is to be completed so that it can used before bad weather sets in.

The Sanitary Engineering Co., 237 Broadway, New York City, has purchased the business of the Municipal Engineering Co. of Delaware, including uncompleted contracts, patents, designs and good will. This company makes a specialty of the design and construction of refuse cremations and sewage purification plants. Correspondence is invited.

The Dartmouth Manufacturing Corporation of New Bedford, Mass., has placed an order with the General Electric Co. for electric equipment for driving a part of its weave shed. This weave shed was designed and is being erected under the supervision of F. P. Sheldon & Co., of Providence, R. I. The apparatus consists of one 3-phase, 60 cycle, 8-pole, 75-k.w., 900 r.p.m., 600-volt, belt-driven, alternating current generator with direct-connected exciter, together with one 75 h.-p., 550-volt, resistance-in-armature type induction motor and necessary switchboard equipment.

A NEW TRACK WRENCH.

The accompanying illustration shows the general arrangement of a new track wrench for repair work as well as construction. It is quickly lifted by merely raising the wheel and the handle of the cam shaft, shown just over the rail head. When this handle is pushed down in the position shown the cam forces a lever against the head of the bolt and holds the machine in place. In laying track all that is necessary is to slip the fish-plates into place, put the bolts in position and attach the nuts on the ends of the bolts by giving them a quarter turn. The wrench is then put in place, with the socket where it will reach the nut and the bolt-head pressed by the lever as mentioned above. The nut is then firmly set up by turning the hand wheel, and the parts are strong enough to allow the man to exert his full strength.



A NEW WRENCH FOR TRACK BOLTS.

The nut sockets are made to fit all sizes of hexagonal and square nuts used on track bolts, thus enabling one machine to answer for work on any size of rails from 35 to 75 lb. The makers, W. H. Anderson & Sons, Detroit, state that this machine will enable one experienced man to do as much work as eight men with the common bar wrench.

PERSONAL NOTES.

Mr. J. A. Hunter has been appointed chief of the Bureau of Highways of Philadelphia.

Mr. St. John Clarke has been appointed chief engineer of the New York & Long Island R. R.

Mr. Donald Lloyd, engineer of the William Tod Co., of Youngstown, Ohio, for the last seven years, has resigned.

Mr. W. G. Lewis has assumed his position as surveyor general of Denver, succeeding Mr. John F. Vivian.

Messrs. Benjamin W. Homans and John A. Rundlett have been appointed assistant engineers on the engineering staff of the Aqueduct Commissioners of New York City.

Mr. M. T. Bassett, of the Bullock Electric Co., of Cincinnati, has been appointed assistant chief engineer of the Allis-Chalmers Co., with headquarters in Milwaukee.

Mr. A. G. Livingston, a division engineer of the Isthmian Canal Commission, with headquarters at Culebra, died Aug. 7, at Culebra. Mr. Livingston's home was in St. Louis.

Mr. R. J. Borhek, of New York, will have charge for the International Fireproofing Co. of the design and erection of the reinforced-concrete work in two office buildings, which are about to be erected in Seattle, Wash.

Mr. B. H. Hudson, Jr., engineer of maintenance of way on the Grand Rapids & Indiana R. R., has been appointed superintendent of the southern division of that road.

Mr. M. A. Hansen, engineer of river protection of the Missouri Pacific R. R., has been appointed chief engineer of the Arkansas Southern R. R., with headquarters at Ruston, La.

Mr. J. R. McColl, formerly associate professor of steam engineering at Purdue University, has accepted a position in the engineering department of the American Blower Co., at Detroit.

Mr. N. C. Van Natta has been appointed chief engineer of the Kanawha & West Virginia R. R., with headquarters at Charleston, W. Va., succeeding Mr. C. P. Peyton, who has resigned.

Mr. J. A. Leger, assistant engineer of the Public Works Department of New Brunswick, Can., has been appointed superintendent engineer for the Maritime Provinces, with headquarters in Halifax.

Mr. R. V. Engstrom has become connected with the structural materials testing laboratory of the U. S. Geological Survey on the World's Fair Grounds at St. Louis and will take up reinforced-concrete research work.

Mr. W. A. Jones, City Engineer of Meadville, Pa., has resigned to accept a position with a railroad construction company. Mr. C. E. Douglas, of New Castle, Pa., a graduate of Allegheny College, has been elected his successor.

Mr. Elliott Holbrook, formerly chief engineer of the Kansas City Southern R. R., has been appointed engineer in charge of the construction of the second track of the Chicago & Alton R. R., between Bloomington and Springfield, Ill.

Mr. F. F. Harrington has resigned as assistant engineer to the chief engineer of the New York Central & Hudson River R. R. to become engineer of bridges of the Tidewater R. R., with headquarters in the Haddington Bldg., Norfolk, Va.

Mr. W. H. Flint, secretary of the American Public Works Association, has sent out a notice that the first annual convention of that Association, which was to have been held at Lookout Mountain in Chattanooga, Aug. 30-31, has been postponed until further notice on account of yellow fever quarantine.

Professor H. J. Ryan, formerly professor of electrical engineering at Cornell University, has gone to Stanford University prior to taking up his duties as professor of electrical engineering and head of the department of electrical engineering at that university.

General Alexander Mackenzie, chief of engineers, U. S. A., is attending the meetings at Boston and Portsmouth of the joint army and navy board on coast defenses. Major Harry F. Hodges, Corps of Engineers, U. S. A., is in charge of the affairs of General Mackenzie's office at the War Department during his absence.

A bronze tablet has been made to be placed in the Kansas State capitol building at Topeka in memory of Mr. Edward Grafstrom, who was drowned June 2, 1903, while doing rescue work when the Kansas River inundated North Topeka, Kan. Mr. Grafstrom was chief mechanical engineer of the Atchinson, Topeka & Santa Fe R. R. at the time, and the details of the accident which caused his death were given in this journal shortly after the accident occurred.

The United States Civil Service Commission will hold examinations on Sept. 13-14, in various cities throughout the country to secure a list of eligibles to fill a vacancy in the position of constructing engineer for sewers and waterworks at Manila, P. I., and other vacancies as they may occur in the Philippine service requiring similar qualifications. Examinations of candidates for the position of architectural and structural draftsman in the Quartermaster's Department at Large, Washington, will be held at the same time.

General Roy Stone, for several years chief of the division of public roads of the U. S. Department of Agriculture, died at his home in Mendham, N. J., Aug. 5. General Stone served throughout the civil war and during the Spanish-American war was brigadier-general and chief of engineers on the staff of General Nelson A. Miles in Porto Rico. At one time he was engaged as an engineer on improvements to the harbor of New York City. He was an ardent advocate of good roads and the creation of the division of public roads of the U. S. Department of Agriculture is said to have been due to a report which he submitted to Congress on the condition of the highways of this country.

Mr. Alfred Isham Totten, a civil engineer of considerable repuation in Kentucky, died recently at his home in Lexington, Ky. Mr. Totten was a resident engineer on the construction of the Cincinnati Southern Ry., division engineer on the construction of the Lexington & Eastern R. R., and was in charge of the construction of the Pittsburg, Connelsville & McKeesport Electric R. R. He was engineer for different coal enterprises in Kentucky and Tennessee for a number of years and at one time was city engineer of Lexington.

CONTRACTING NEWS

OF SPECIAL INTEREST TO CONTRACTORS, BUILDERS, ENGINEERS AND MANUFACTURERS OF ENGINEERING AND BUILDING SUPPLIES.

WATER.

Notes Arranged Alphabetically by States.

Horse Creek, Ala.—P. Byrne, P. O. Box 111 Birmingham, is preparing plans for water works for Horse Creek, to include c.-i. pipe, power house, pump and boiler, valves and hydrants, a pumping basin and concrete lined reservoir.

Douglas, Ariz.—See "Power Plants, Gas and Electricity."

Anaheim, Cal.—See "Power Plants, Gas and Electricity."

South Pasadena, Cal.—A. Hinckley, City Clk., writes that an election will probably soon be called, to vote on issuing bonds for water works.

Santa Monica, Cal.—The Fountain Glen Water Co., of Ocean Park and Santa Monica, is reported incorporated with a capital of $25,000. Directors: W. G. Bentley, B. S. Garrison and others.

San Diego, Cal.—The citizens are reported to have voted to issue $54,000 bonds for replacing the 30th St. water main and $75,000 for the "B" St. conduit.

Idaho Springs, Colo.—It is reported that bids will be received until Aug. 21 by Chas Brandstetter, City Clk., for improving and extending the water works.

Montrose, Colo.—Bids will be received until Sept. 26, at the office of the U. S. Reclamation Service, Montrose, for the completion of Gunnison tunnel, involving about 27,500 lin. ft. of tunnel, as advertised in The Engineering Record.

Pueblo, Colo.—A committee has been appointed with John Cameron as chairman, to investigate the matter of supplying the city south of Arkansas River with mountain water by a gravity system. After the report of the committee, the voters of the south district will probably decide whether to purchase the present plant of the Pueblo Water Co., pumping Arkansas River water to the district; whether they will condemn such plant for the city, or whether they will construct a mountain water gravity plant. The cost of the latter plant will be about $1,500,000, including necessary storage. Engineers Peach & Knight have done some surveying of reservoir sites.

Washington, D. C.—See "Power Plants, Gas and Electricity."

Wilmington, Del.—Bids will be received until Sept. 4 by the Bd. of Water Comrs. for constructing a 35,000,000 gal. reservoir, as advertised in The Engineering Record.

Monroe, Ga.—Bids will be received by the Mayor and Council on Aug. 28 for machinery, material and construction of a system of water works, as advertised in The Engineering Record.

Moscow, Idaho.—The city is reported to be considering the question of installing a meter system in the business district.

Nampa, Idaho.—C. C. Stevenson, Irrigation Engr., in his report to the directors of the Nampa-Meridian Irrigation Dist. estimates the cost of enlarging the canal and constructing a dam at $282,600.

Chicago, Ill.—Bids will be received until Aug. 22 by J. M. Patterson, Comr. Pub. Wks., for furnishing and constructing, where desired, approximately 450 pieces of 16-in. and 1,350 pieces of 24-in. c.-i. water pipe.

**Chicago, Ill.*—The contract for constructing a brick water tunnel, bids opened July 29 by the Bd. of Pub. Wks., has been awarded to the Jackson & Corbett Co., Rookery Bldg., for $137,617. The contract for constructing a circular concrete well at Norwood Park pumping station (bids opened July 28) has been awarded to John H. McCarthy, Chamber of Commerce Bldg., for $2,375.

*Peter C. Stadler, 890 Millard Ave., is stated to have secured the contract on Aug. 3 for building a tunnel connecting the 39th St. pumping station.

East Moline, Ill.—It is not propsed to let contracts for the construction of water works until next year. Engineers, Kimball Eng. Co., of Davenport, Ia.

Hoopeston, Ill.—Bids will be received until Aug. 17 by the Bldg. Com. (H. C. Green, Chmn.), for furnishing material and installing a boiler and pump house at the pumping station.

Minooka, Ill.—Contracts will probably soon be let for the construction of water works. C. E. Davis, Mayor.

**Greenville, Ky.*—Wm. Eades is reported interested in the construction of water works.

Owensboro, Ky.—Bids will be opened on Aug. 31 by the Owensboro Water Wks. Co. (J. J. Sweeney, Pres.) for furnishing and constructing a clear water supply from the sand and gravel bed across the Ohio River. Owen Ford, Consulting Engr., Security Bldg., St. Louis, Mo.

Princeton, Ky.—This city has deposited in bank proceeds of $35,000 bond issue for water works, and has authorized Engineer Granberry Jackson, of Nashville, Tenn., to have specifications printed, etc., preparatory to letting contracts on material and construction.

Hammond, La.—Bids for the construction of water works, which were to have been opened on Aug. 8 have been indefinitely postponed. Address, Jas. B. Adams, Town Clk.

Augusta, Me.—The following are the bids opened on Aug. 3 by the Trus. of Augusta Water Dist. (W. B. Getchell, Superv. Engr.) for building Carleton Pond dam and reservoir: F. B. Lee, $11,129. C. E. Hoxie, $14,689, and E. M. Stacy, $18,595 (bidders all of Augusta).

Agawam, Mass.—At a special town meeting July 28 it was voted to appropriate $12,000 to establish a water system in the district of Mittineague.

Marshall, Mich.—See "Power Plants, Gas and Electricity."

St. Cloud, Minn.—Later reports state that the date of opening of bids for the proposed filter plant is Aug. 21. H. T. Limperich, City Clk.

Thief River Falls, Minn.—Bids are wanted until Aug. 22 for a 750-gal. per minute triplex power pump, a 300-gal. per minute deep well pump and a 30-h.p., 220-volt direct-current motor all installed. O. Clausen, Consulting Engr., St. Paul.

Houston, Miss.—See "Power Plants, Gas and Electricity."

Arlington, Neb.—Bids are wanted Aug. 22 for the construction of water works; probable cost $13,000. B. F. Hadley, Village Clk. M. A. Earl, Engr., 1st Natl. Bank Bldg., Chicago, Ill.

Benson, Neb.—The citizens are reported to have voted to issue $20,000 bonds for the construction of water works.

Lincoln, Neb.—The City Council is reported to have ordered the immediate construction of a 1,500,000-gal. reservoir; the building of a pump house; the purchase of a 3,000,000-gal. turbine pump for lifting water; the installation of two pumps in the well with the purchase of another induction motor to run one of the pumps, and the construction of a roof over the Tyler well at the Mockett station.

Stromsburg, Neb.—C. V. Nelson, City Clk., writes that bids will be received until Sept. 5 for the erection of a standpipe, 100 ft. high, 12 ft. diam.; probable cost, $3,500 to $4,000.

Albany, N. Y.—Wallace Greenalch, Supt. of the Bureau of Water, is reported to have submitted to the Bd. of Contract and Supply, plans for the new intake of the filtration plant. They have been sent to the War Dept. at Washington for approval.

Brooklyn, N. Y.—The following are the bids opened on Aug. 9 by John T. Oakley, Comr. Water Supply, Gas and Electricity, N. Y. City, for furnishing material and constructing the new Gravesend pumping station, Boro. of Brooklyn (bidders of Brooklyn unless otherwise mentioned.) Jas. MacArthur, 22 Ormand Pl., $28,221; Behan & Cavanagh, 23d St. & 4th Ave., N. Y. City, $26,583; Geo. T. Driscoll, 391 Fulton St., Brooklyn, $29,900; Ryan & McFerran, 106 E. 23d St., N. Y. City, $22,733; Geo. Hildebrand, 38 Park Row, N. Y. City, $26,200; Chas. Meads Co., 299 B'way, N. Y. City, $27,620; D. J. Ryan, 723 3d Ave., $25,500; Thos. G. Carlin, 44 Court St., $26,990; Fuller & O'Connor, 26 Court St., $26,665; R. J. F. Gerstle Co., 44th St. and 1st Ave., N. Y. City, $27,572, and R. E. Henningham, 4 Court Sq., $25,363.

Ft. Plain, N. Y.—F. K. Baxter, of Utica, is preparing plans and specifications for deepening reservoir and paving its sides and for other water works improvements at Ft. Plain. The village voted on July 25 to expend $15,000 for this work.

Niagara Falls, N. Y.—Mayor Cutler is reported to be in favor of increasing and purifying the water supply of the city.

**Turin, N. Y.*—J. J. Siegrist, of Utica, is stated to have secured the contract for constructing water works (bids opened July 22) for $14,000.

Dickinson, N. D.—Loweth & Wolff, of St. Paul, Minn., estimates the cost of constructing water works for Dickinson, using deep wells as a source of supply, at $34,156, and using Heart River as a source of supply, $39,281.

Enderlin, N. D.—It is stated that bids will be received until Aug. 24 for constructing water works. E. T. Danielson, City Aud.; T. R. Atkinson, Engr., Fargo.

Chicago Junction, O.—Bids will be received until Aug. 17 by the Bd. Trus. of Pub. Affairs (F. A. Moody, Engr.) for furnishing pumping machinery for the water works.

Cincinnati, O.—Bids will be received until Aug. 29 by the Bd. Trus., Comrs. of Water Wks. (Aug. Hermann, Pres.) for unloading and hauling c. i. pipe, special castings and valves from the various railroad yards and delivering same along the different streets in the city.

*The Bd. of Water Comrs. are stated to have awarded on Aug. 4, to Keeling & Ridge, of Pittsburg, Pa., the contract for laying 42 and 44-in. water mains on Eggleston Ave. and 9th St. for $44,742. The other bids for this work (opened on Aug. 1) were as follows: Guy M. Gest, $46,403; Kirchner Constr. Co., $46,804, and McCarthy Bros., $76,889. Contracts for the electrically operated sluice valves for the new filtration plant, at $23,650, and for other valves at $30,046, are reported to have been awarded on Aug. 4 to the Coffin Valve Co., Boston, Mass., and contracts for mud gate and other valves, also for the filtration plant, were let to the Fairbanks Co., of New York, N. Y., and Pittsburg, for $74,157.

Cleveland, O.—Press reports state that bids will be received until Sept. 1 for $2,000,000 water bonds, $23,000 sewer, $250,000 paving and $170,000 fire improvement bonds.

Fredericktown, O.—Bids will be received by the Bd. of Pub. Affairs until Aug. 25 for the construction of water works, as advertised in The Engineering Record.

Toledo, O.—Bids will be received until Sept. 7 by the Bd. Pub. Service (Harry Jones, Secy.) for constructing Section No. 2 of the filtered water conduit, about 2,900 ft. long, 6-in. internal diameter. Bids on labor and material to be submitted separately.

**Items marked thus give the names of parties awarded contracts.*

**Allegheny, Pa.*—The following are reported to be the bids opened on July 31 by the Dept. of Pub. Wks. for constructing a manifold conduit system from the Montrose pumping station to Allegheny: Jas. McNeil & Bro. Co., $72,000; Thos. A. Gillespie Co., $74,000, and the International Constr. Co., Bessemer Bldg., $56,523 (awarded contract).

*The Pearson Mfg. Co. is stated to have secured the contract for a hand crane at the Howard St. pumping station for $3,550.

All bids opened July 31 by the Bd. of Pub. Wks. for laying water pipe in Perryville Ave. and in Sycamore, Main and E. Lacock Sts. are stated to have been rejected, and new bids will be received.

Coatesville, Pa.—Bids will be received until Aug. 21 by the Boro. Council for constructing bottom in reservoir of cement and mastic asphalt; also about 450 ft. of concrete conduit. Hugh T. Downing, Boro. Engr.

Erie, Pa.—Bids will be received until Sept. 2 by Comrs. of Water Wks. (Geo. C. Gensheimer, Secy.), for taking down by sections the 140-ft. steel smoke stack and 85 ft. of fire brick lining at the water works pumping station, also on same date for constructing a brick chimney, 175 ft. in height and 8 ft. internal diameter, upon the foundation of the present steel chimney at the water works pumping station, alternate bids will be received for the construction of a chimney of like size of reinforced concrete, also of perforated radial brick, known as the "Alphons Custodis" Chimney, also for any other perforated radial brick chimney. Bids submitted on other than brick chimneys are to include plans and specifications.

Philadelphia, Pa.—The Common and Select Council have passed ordinances providing for the laying of water mains in numerous streets.

**Ft. Pierre, S. D.*—The contract for constructing water works at Ft. Pierre has been awarded to W. D. Lovell & Co., of Minneapolis, Minn., with the exception of gasholder, which will probably go to Drake, Williams, Mount Co., of Omaha, Neb. Engineer, M. A. Earl, 1st Natl. Bank Bldg., Chicago, Ill.

Twin Brooks, S. D.—Bonds to the amount of $2,700 are reported sold, to be used for installing an air pressure water works.

Ft. Brown, Tex.—Bids will be received until Sept. 2 by Robt. R. Stevens, Ch. Q. M., San Antonio, for furnishing and installing a 40-hp. steam boiler at pumping station, Ft. Brown.

San Felipe, Tex.—Preliminary surveys are now being made for an irrigating canal to take its water from Brazoo River. Address, Engineer, H. Ludwig, of Sealy.

Salt Lake City, Utah.—Bids will be received until Sept. 4 by the Bd. Pub. Wks. for constructing a reinforced concrete conduit for the water supply, to be known as the "Big Cottonwood Conduit," as advertised in The Engineering Record.

**Seattle, Wash.*—The International Contract Co., 738 New York Blk., Seattle, secured the contract for laying water mains on Lane and other streets (bids opened Aug. 5) at total of $25,206, including gates, hydrants, etc. This company bid for 925 lin. ft. 12-in. c. i. pipe, $2.05; 960 ft. 10-in., $1.72; 12,655 ft. 8-in., $1.28, and 300 ft. 6-in., 99 cts. It bid for 2,280 lin. ft. 2-in. galvanized wrought iron pipe, 30 cts. The other bids received for this work were: Puget Sound Bridge & Dredging Co., $26,548; Bell & Price, $26,227; F. McLellan, $25,670, and Stirrat & Goetz, $26,430 (bidders all of Seattle).

Harrisville, W. Va.—H. Marsh, Town Recorder, writes that it is proposed to issue $12,000 bonds for the construction of water works.

La Crosse, Wis.—The City Council is reported to have decided to lay 3 miles of water mains.

West Allis, Wis.—It is stated that bids will be received until Aug. 16 by the Village Bd. for laying the water system, estimated to cost $60,000 and the sewer system estimated to cost $15,000.

Prince Albert, Sask., N. W. Ter.—It is stated that bids will be received until Aug. 16 by Wm. Cowan, Mayor, for a pump house, pumping machinery, sedimentation basins, ntake walls, and 2 return tubular boilers; also for piping, hydrants, valves, specials and water tower. Willis Chipman, Engr., Toronto, Ont.

SEWERAGE AND SEWAGE DISPOSAL.

Notes Arranged Alphabetically by States.

**San Francisco, Cal.*—Thos. P. Woodward, City Engr., writes that the City Street Improvement Co. has secured he contract for sewers in 4th St. from Howard to Channel St., including sewers for sewage only and for storm waters, for $73,987.66.

Plans and specifications have been prepared, and bids will soon be received for a sewer in 6th St., estimated to cost $60,000, and for one in Persia Ave., estimated cost, $30,000.

Oxnard, Cal.—C. J. Elliott, City Clk., writes that the citizens voted July 31 to issue $45,000 bonds for the construction of a sewerage system.

Washington, D. C.—Bids will be received at the office of the Comrs. D. C. on Aug. 21 for constructing sewers in the Dist. of Columbia; also on same date for c. i. pipe and specials for outfall sewage disposal system, both proposals advertised in The Engineering Record.

Pensacola, Fla.—It is proposed to issue bonds for paving, sewerage and other improvements. Wm. F. Lee, City Engr.

**Marion, Ill.*—Geo. C. Campbell, City Clk., writes that B. S. Crain has secured the contract for constructing a sewerage system for $20,000 and the work is now under way. Bids for the purchase of $20,000 bonds will be received on Aug. 14.

Pekin, Ill.—The City Clerk writes that it is proposed to construct a sanitary and surface sewer, of both brick and pipe, at a cost of about $150,000. Bids will probably be called for in the course of 6 months. Benj. F. Smith, City Engr.

Chicago, Ill.—Bids will be received until Aug. 19 by the Dept. Pub. Wks. (Jos. M. Patterson, Comr.) for furnishing material and erecting the Lawrence Ave. Sewerage Pumping Station.

Rockford, Ill.—Bids will be received until Aug. 25 by the Bd. Local Improv. for constructing sewers in portions of several streets, estimated to cost $11,355, as advertised in The Engineering Record.

Batavia, Ill.—C. A. Prout, of Elgin, is reported to have prepared plans for sewers for Batavia, to cost about $75,000.

South Bend, Ind.—City Engr. A. J. Hammond has prepared plans for pipe sewers in 4 streets. Bids will be received about Sept. 1.

Tulsa, Ind. Ter.—N. J. Gubser, City Recorder, writes that bids will be received until Aug. 21 for the construction of a sewerage system; probable cost, $30,000. Engineer, J. Gus. Patton.

Des Moines, Ia.—It is stated that bids will be received until Aug. 23 by the Bd. Pub. Wks. for constructing about 1,600 ft. of 12-in. vitrified clay pipe sewers.

Ames, Ia.—Bids will be received until Aug. 28 for the construction of about 3½ miles of sanitary sewers, 8 and 10-in. drain, as advertised in The Engineering Record.

**Perry, Ia.*—The Regan Constr. Co., of Des Moines, has secured the contract for constructing a sewerage system (bids opened Aug. 2). The work to be constructed at this time will amount to $40,000. Standard sewer pipe 8 to 18 in. will be used and a septic tank will be installed. M. A. Earl, Consulting Engr., 1st Natl. Bank Bldg., Chicago, Ill.

Hopkinsville, Ky.—Bids will be received until Aug. 18 by the Hopkinsville Sewerage Co., for constructing about 7 or more miles of sanitary sewers, ranging from 6 to 18-in. in diameter, with manholes and appurtenances, including a septic tank. W. S. Shields, Des. Engr., 1715 Marquette Bldg., Chicago, Ill.

Portland, Me.—Bids will be received until Aug. 23 by Geo. N. Fernald, Comr. Pub. Wks., for constructing Sec. 3, West Side intercepting sewer; also Aug. 22 for constructing about 764 ft. of the North Side intercepting sewer.

Cambridge, Md.—Mayor Clement G. Rogers, in his annual report to Council recommends the construction of a sewerage system.

Lowell, Mass.—The Com. on Sewers has voted to recommended a loan order of $50,000 for sewer construction.

Wyandotte, Mich.—The lowest bid opened on Aug. 2 for the construction of about 14¾ miles of sewers, is reported to have been submitted by Lennane Bros., of Detroit, for about $80,751.

**Pipestone, Minn.*—S. W. Funk, City Recorder, writes that the following are the bids opened on Aug. 2 by Common Council for constructing sewers, 2 reinforced concrete septic tanks, etc.: Symes & Powers, Sioux Falls, S. D., $14,696; Fraser & Elliott, Rochester, Minn., $14,816; R. F. Westen, La Crosse, Wis., $12,466 (awarded contract), and O. C. Schreiter & Co., Port Washington, Wis., $14,537.

Farmington, Mo.—See "Power Plants, Gas and Electricity."

Cape Girardean, Mo.—The City Council has by ordinance established sewer districts, and specifications are now being printed. Plans for this system have been prepared by Granberry Jackson, of Nashville, Tenn. Contracts for material and construction will be let in September.

St. Joseph, Mo.—Contracts will probably soon be let for the construction of the South St. Joseph sewer and the Wyatt Park sewer. Wm. H. Floyd, Jr., City Engr.

West Hoboken, N. J.—It is stated that bids will be received until Aug. 16 by the Town Council for constructing sewers in several streets. John P. McMahon, Town Clk.

Newton, N. J.—Bids will be received until Sept. 2 by the Town Com. for furnishing material and laying about 7 miles of sewer pipe and building complete 2 sewage purification plant, as advertised in The Engineering Record.

**Phillipsburg, N. J.*—Robt. Parsons Howell, Town Surveyor, writes that the following are the totals of bids opened on Aug. 5 for constructing pipe sewers: Wilkes-Barre Con. Co., Wilkes-Barre, Pa., $6,607 (awarded contract); Antonio DeLucia, Trenton, $11,068; Stacy B. Opdyke, New York, N. Y., $10,745; Wm. Och & Co., Phillipsburg, $7,399; John F. Hanlon, Philadelphia, Pa., $8,622; M. J. Cannon, Phillipsburg, $10,743; Jas. E. Miles, Easton, Pa., $8,814; Robt. W. Smith, New York, N. Y., $9,160; Shimel & Hills, Easton, Pa., $7,156; Michael O'Hagen, Phillipsburg, $9,400, and F. F. Cannon & J. Murray, Phillipsburg, $14,602.

Harrison, N. J.—Bids will be received until Sept. 5 by the Com. on Sewers and Drainage of the Common Council (Edwd. J. Rice, Chmn.) for constructing a sewer in portions of Dey and Jersey Sts. Approximate quantities. 910 lin. ft. 20 and 10-in. vitr. pipe; 3 junction manholes; 4 manholes and 4 basins; C. Melville Borrie, Town Surveyor, 788 Broad St., Newark.

Brooklyn, N. Y.—Bids will be received until Aug. 16 by Martin W. Littleton, Pres. Brooklyn Boro., for furnishing material and constructing a sewer in Bay 23d St., and 96th St. Engineer's estimate: 550 lin. ft. 24, 45 lin. ft. 15, 1,525 lin. ft. 12-in. pipe, 22 manholes, 16,300 ft. B. M. found. plank., etc., also for constructing sewer basins in Farragut Road, Bedford Ave. and Westminster Road, in all about 26 basins.

Scotia, N. Y.—All bids opened on July 27 for the construction of a sewage disposal plant are stated to have been rejected and new bids will be received. Jas. Hoyt, Jr., Village Clk.

Buffalo, N. Y.—Francis G. Ward, Comr. of Pub. Wks., is reported to have petitioned the Bd. of Aldermen for authority to build an outlet sewer in Liberty St., which parallels the Clark & Skinner Canal.

Rensselaer, N. Y.—Bids will be received until Aug. 15 by John G. Salt, City Clk., for constructing a 12-in. vitr. clay pipe sewer, in a portion of Birch St., a 10-in. sewer in 2d St., and an 8-in. vitr. clay pipe sewer in portions of several other streets.

**Grafton, N. D.*—L. B. Baldwin, Supt. N. D. Instit. for Feeble Minded, writes that the contract for constructing septic tank, pump house and installing machinery, and also extending city sewer (bids opened Aug. 5) has been awarded to the Symms-Powers Co., of Sioux Falls, S. D., for $7,500.

Columbus, O.—The following are the bids opened on Aug. 4 by the Bd. of Pub. Service (Julian Griggs, Ch. Engr.) for the construction of the Jackson Pike sewer; bids were submitted on two classes, (1) brick, (2) brick and concrete: (*a*) C. T. McCracken & Co., Columbus, (1) $45,554, (2) $50,031; (*b*) M. O'Herron & Co., Pittsburg, Pa., (1) $47,359, (2) $50,856; (*c*) A. F. Helm, Cleveland, (1) $61,485, (2) $63,851.

	a	*b*	*c*
1,700 lin. ft. trench for 42-in. sewer.	$1.90	$2.40	$3.00
5,620 lin. ft. trench for 36-in. sewer.	3.45	3.50	5.00
80 cu. yd. excav....................	1.00	1.00	1.25
1,700 lin. ft. 42-in. brick sewer.....	3.33	3.30	3.60
1,700 lin. ft. 42-in. brick and concrete	3.98	4.20	4.00
5,620 lin. ft. 36-in. brick sewer......	2.85	2.95	3.50
5,620 lin. ft. 36-in. brick and concrete	3.45	3.30	3.80
21 manholes	50.00	50.00	100.00
90 6-in. inlets......................	.30	1.00	.50
100 6-in. penstocks.................	1.00	2.00	2.50

Columbus, O.—The following are the bids opened on Aug. 4 by the Bd. of Pub. Service for constructing cross-over sewers in Sullivan Ave. and McDowell St.: (*a*) brick; (*b*) brick and concrete: M. O. Herron & Co., Pittsburg, Pa., *a* $5,831, *b* $6,443; A. F. Helm, Cleveland, *a* $6,730, *b* $7,002; C. T. McCracken & Co., Columbus, *a* $9,408, *b* $9,850.

St. Marys, O.—F. C. Kenthan, City Engr., writes that at the November election the citizens will vote on issuing $75,000 bonds for a sewerage system.

Cincinnati, O.—J. E. Breen, Ch. Engr. Bd. Pub. Service, writes that plans have been made and adopted by Council, for the proposed sewer in Duck Creek Road. It will be of brick and pipe. Bids will probably not be asked for about 3 or 4 months. According to press reports it will cost about $65,000.

Bids will be received until Aug. 21 by the Bd. Pub. Service (Geo. F. Holmes, Clk.) for furnishing material and constructing sewers in a portion of Burnet Ave.

Berea, O.—It is stated that bids will be received until Aug. 21 by the Village Council, for constructing a 20-in. sewer tile drain in West St. O. R. Stone, Village Clk.

Cleveland, O.—See "Water."

Marion, O.—It is reported that bids will be received until Aug. 16 by the Bd. Pub. Service (Wm. Fies, Clk.), for furnishing material and constructing a sanitary sewer in Pearl St.

Mt. Oliver, Pa.—Bids will be received until Aug. 16th by the Rankin Improv. Co. for the construction of a sewer 3,375 ft. long on its "Pen Manor" plan of lots, Mt. Oliver. Rankin & Hengst, Engrs., 301 Smithfield St., Pittsburg.

Washington, Pa.—See "Paving and Roadmaking."

Uniontown, Pa.—Bids will be received until Aug. 7 by Chas. F. Kefover, Boro. Solicitor and Clk. of Council, for constructing a 10-in. sewer in a portion of E. Berkley St. Porter & Hogg, Boro. Engrs.

Hollidaysburg, Pa.—The City Council is reported to have passed an ordinance providing for the construction of a flood sewer in Juniata St.

Alexandria, S. D.—F. D. Peckham, Secy. Alexandria Sewerage Co., writes that it is proposed to construct a sewerage system, at a cost of $2,000.

Port Arthur, Tex.—The City Council is reported to have granted R. C. Holmes a franchise for a sewerage system.

Richmond, Va.—The Street Com. on Aug. 3 favorably recommended an ordinance providing for the construction of a sewer from the Bacon Quarter Branch, along

**Columbus, O.*—The following are the bids opened on Aug. 4 by the Bd. of Pub. Service (Julian Griggs, Ch. Engr.) for the construction of the Renick Run storm sewer and a portion of the West Side sanitary sewer: (*a*) Westwater & Casey, Columbus (awarded contract); (*b*) Burkhardt & Lehman, Cleveland; (*c*) C. T. McCracken & Co., Columbus; (*d*) Murphy, Miles & Sullivan, Columbus; (*e*) M. O'Herron & Co., Pittsburg, Pa.; (*f*) Cooke, Grant & Fritz Bros., Columbus:

	* *a*	*b*	*c*	*d*	*e*	*f*
23,600 cu. yd. excav................	$0.83	$0.55	$0.67	$0.59	$1.00	$0.85
6,600 cu. yd. concrete..............	6.10	7.15	6.74	7.25	6.00	7.25
25 lin. ft. 15-in. vitr. sewer pipe..........	.50	1.50	1.00	.50	2.00	.55
40 cu. yd. broken stone-gravel..........	1.00	1.25	1.50	1.00	2.00	1.25
15 cu. yd. dry stone paving..........	3.00	6.00	3.00	5.00	6.00	3.05
12,000 lb. misc. iron work..........	.04	.04¾	.05	.05	.05	.05
Total..............................	$60,455	$60,945	$61,056	$62,525	$64,056	$68,645

**Items marked thus give the names of parties awarded contracts.*

the Boule. to Cary St., with branches on Broad, Grace, Franklin and other streets; probable cost, $103,000.

**Seattle, Wash.*—T. Ryan, Sullivan Bldg., has secured the contract for constructing sewers on Westlake Ave. and other streets (bids opened July 29) at the following bid; fixed estimate, $750: 492 lin. ft. 21-in. pipe sewer, $3.50; 240 lin. ft. 18-in. pipe sewer, $2.70; 1,387 lin. ft. 15-in. and 12-in. pipe sewer, $2; 14 4½-ft. manholes, $75; 1 manhole to be reconstructed, $70; 754 lin. ft. 28x42-in. Oviform brick sewer, $6.30, and 398 lin. ft. 24-in. pipe sewer, $5; total cost $13,747. The only other bid received was from Stirrat & Goetz, 602 Bailey Bldg., for $16,269.

West Allis, Wis.—See “Water.”

**Milwaukee, Wis.*—The contract for building a brick sewer in Keefe Ave., 2,553 ft., is reported to have been awarded by the Bd. of Pub. Wks. to E. Bowles at $6.29 per ft.

Merrill, Wis.—F. E. Mathews, City Engr., writes that all bids opened on July 25 for constructing sewers in Cottage, W. 4th and State Sts. have been rejected. The work proposed consists of 3,652 ft. 10, 12, 15 and 16-in. salt-glazed vitr. sewer, 8 manholes and 21 catchbasins.

**Edgerton, Wis.*—Henry Johnson, City Clk., writes that the contract for constructing about 24,000 lin. ft. vitrified pipe sewers /bids opened Aug. 5) has been awarded to Harding & Nelson, of Racine, Wis.

Sheridan, Wyo.—Bids will be received until Aug. 21 by the Mayor and Bd. of Town Trus. for furnishing material and constructing a sewer system. E. W. Long, Town Clk.

Toronto, Ont.—Bids will be received until Aug. 15 by Mayor Thos. Urquhart, Chmn. Bd. Control, for constructing sewers in portions of Millicent St. and Gladstone Ave.

Winnepeg, Man.—Bids will be received until Aug. 26 by J. H. Agnew, Provincial Treas., for about $136,000 drainage dist. bonds.

BRIDGES.

Notes Arranged Alphabetically by States.

Pensacola, Fla.—It is reported that bids will be received until Oct. 1 by A. M. McMillan, Clk. Co. Comrs., Pensacola, for constructing a steel bridge across Perdido River, near Muscogee.

Chicago, Ill.—Bids will be received until Oct. 4 by the Bd. Trus. of the Sanitary Dist. of Chicago (S. D. Griffin, Clk.) for constructing the substructure of a bridge across Chicago River at Dearborn St.; also on same date separate bids for the construction of the superstructure of said bridge. The bridge is to be of the Scherzer rolling lift patent.

Peoria, Ill.—The Bridge Com. of Peoria Council is stated to have reported in favor of constructing a bridge, at a cost of about $150,000.

Lexington, Ky.—The General Council is stated to have passed an ordinance authorizing an election to be held to vote on issuing $27,000 bonds to construct a viaduct over Ayers Alley.

Boston, Mass.—The lowest bid opened on Aug. 7 by the Metropolitan Park Comn. for constructing the Boylston St. bridge and approaches and masonry dam, at Charles River Reservation, Newton and Wellesley, is stated to have been submitted by Thos. E. Ruggles, 95 Milk St., for about $23,000.

Detroit, Mich.—Plans for the bridge to be constructed over Portage River are stated to have been approved by the Secy. of War. The structure will have a 274-ft. draw and cost $92,000.

Montclair, N. J.—See “Railroads.”

New York, N. Y.—The following are the bids opened on Aug. 10 by Geo. E. Best, Comr. of Bridges, for furnishing metal work for the anchorages and constructing the towers, cables, suspenders and suspended superstructure of the Manhattan Bridge over the East River: Pennsylvania Steel Co., Steelton, Pa., $7,284,739; R. H. Hood, New York, $7,956,712; King Bridge Co., Cleveland, O., $9,312,940; John Peirce, New York, $7,486,491, and Milliken Bros., New York, $7,983,970. All of the bids are regular.

**Buffalo, N. Y.*—Neil Savage is stated to have received the contract for constructing substructure of a bridge over Buffalo River at River St. (bids opened July 20) for $5,500.

Morehead City, N. C.—It is stated that the Atlantic & North Carolina R. R. Co. (R. P. Foster, Gen. Mgr., Goldsboro) will construct a bridge over Newport River, at Morehead. The structure to be 2½ miles long and cost about $200,000.

Mandan, N. D.—Bids will be received until Sept. 4 by the Co. Comrs. for constructing a combination bridge across Heart River, to be 136 ft. long. H. J. Tavis, Co. Aud.

**Springfield, O.*—Geo. R. Cornor, Clk. Bd. Pub. Service, writes that the Variety Iron Wks., of Cleveland, has secured the contract for constructing the superstructure of an iron bridge over Buck Creek, on Water St., for $10,760, and Jas. Bolan, of Springfield, secured the contract for the concrete abutment at $6.70 per cu. yd. (bids opened Aug. 3).

Columbus, O.—See “Paving and Roadmaking.”

Zanesville, O.—It is stated that the Bd. County Comrs. will soon receive bids for repairing 5th St. Bridge; probable cost of the improvement $20,000.

Dayton, O.—Bids, including plans and specifications, will be received until Aug. 26 (readvertisement) by the Joint Bd. Co. Comrs. of Montgomery and Preble Counties for furnishing materials and constructing the superstructure of a high truss bridge over Big Twin Creek, between Jackson and Lanier Townships, consisting of 2 spans, each 150 ft. long, with a 16-ft. roadway; also separate bids will be received for approaches to said bridge. T. J. Kauffman, Aud., Montgomery Co.

Hays, Pa.—Bids will be received until Aug. 19 by Arthur Ball, Boro. Clk., for constructing a steel bridge.

Norristown, Pa.—Bids will be received until Sept. 2 by the Bd. Co. Comrs. (Benj. F. Penrose, Chmn.) for constructing a stone arch bridge at Freed's Mill, Franconia Township.

Philadelphia, Pa.—The Common Council is stated to have passed the ordinance approving the contract of Millard & McGraw Constr. Co., Arcade Bldg., for constructing a bridge on the line of 33d St. over the connecting railway.

Spartanburg, S. C.—It is stated that bids will be received until Aug. 15 by the Co. Comrs. (F. C. West, Clk.) for constructing a bridge at Inman Mill.

**Hoult, W. Va.*—D. D. Carothers, of Baltimore, Md., Ch. Engr. Baltimore & Ohio R. R. Co., writes that F. H. Clements & Co., Land Title Bldg., Philadelphia, Pa., has secured the contract for the masonry of the new B. & O. bridge at Hoult.

**Charleston, W. Va.*—The contract for constructing a truss bridge over Elk River (bids opened July 20) is stated to have been awarded to the Penn Bridge Co., of Beaver Falls, Pa., for $48,000.

**Webster Springs, W. Va.*—The County Court is stated to have awarded the contract for constructing an iron bridge over east branch of Elk River, at Webster Springs, to the Canton Bridge Co., of Canton, O., for $7,450.

**Green Bay, Wis.*—Engr. A. Brauns, 220 N. Washington St., Green Bay, writes that the contract for constructing steel bridges in Pittsville and New Denmark Townships were let at Green Bay on Aug. 5 to H. S. Wetherell, of Chicago, Ill.

Racine, Wis.—It is reported that bids will be received until Aug. 17 by the Bd. Pub. Wks. (P. H. Connolly, Chm.) for furnishing material and removing the substructure and superstructure of the present Root River bridge and constructing a new swing bridge and approach.

PAVING AND ROADMAKING.

Notes Arranged Alphabetically by States.

Birmingham, Ala.—An ordinance is stated to have been passed providing for the paving of First Ave. in Woodlawn, at a cost of $6,000.

**San Francisco, Cal.*—Thos. P. Woodward, City Engr., writes that the contract for paving with asphalt Valencia St. from 18th St. to Mission St. has been awarded to the City Street Improvement Co. for $42,357. The principal items were 21,412 sq. ft. basalt block gutters at 36 cts., and 162,029 sq. ft. of asphalt pavet., consisting of 6-in. concrete found., 1½-in. binder and 2-in. asphalt wearing surface, at 17 cts. He further states that oil has been very successfully applied for several years to the roads in Golden Gate Park, under control of Park Comrs. The city is about to apply it to some of its macadamized streets, and a contract has been let to C. S. Harney for the preparation and oiling of Fulton St. from 1st Ave. to 12th Ave. The prices were: For furnishing and spreading rock, including macadam screenings, $1.69 per cu. yd.; for furnishing and spreading oil on street surface, including regrading, 14¾ cts. per sq. yd.

Denver, Colo.—T. W. Jaycox, State Engr., writes that T. S. Faris and F. A. Fitch, both of Sulphur Springs, Colo., bid for 123,700 ft. of wagon road, $8,706 and $10,000 respectively, and E. C. Phillips, of Longmont, bid for 144,700 ft., $11,000 (bids opened Aug. 1.)

**Waterbury, Conn.*—Main and W. Willow Sts. will be paved with bitulithic at $2.30 per sq. yd., the contract having been awarded to Warren Bros. Co., of Boston, Mass.

Wilmington, Del.—Bids will be received until Aug. 17 by the Bd. of Directors of the Street and Sewer Dept. (L. V. Christy, Secy.) for grading, furnishing material and paving 5,000 sq. yds., 10,000 sq. yds. or 20,000 sq. yds. of either sheet asphalt or bitulithic pavement.

Pensacola, Fla.—See “Sewerage and Sewage Disposal.”

Wallace, Idaho.—It is stated that the Idaho Intermountain Wagon Road Comn. (F. R. Gooding, Chmn.) will receive bids until Sept. 1 for constructing roads and trails as follows: From Hord's Mill on St. Joe River to summit of the St. Joe Range, about 2¾ miles; from end of trail at Cedar Creek to St. Joe River, about 10 miles, and from Rex mill to mouth of Granite Creek at Raven. Geo. R. Trask, Engr. in Charge, Wallace.

Elgin, Ill.—The Bd. of Local Improv. is stated to have passed a resolution providing for the paving with asphalt on Highland St., at $53,000.

**Sterling, Ill.*—Samuel H. Benner, of Sterling, is stated to have received the contract for macadamizing about 20 blocks throughout the city for $14,788.

Peru, Ill.—Emil Schaid, Chmn. Com., writes that the date of opening of bids for paving with asphalt, about 4,000 sq. yds. in the Central School has been extended from Aug. 1 to Aug. 15.

**Logansport, Ind.*—The Western Constr. Co. has secured the contract for 22,000 sq. yds. bitulithic in Logansport.

**Indianapolis, Ind.*—The Hoosier Constr. Co., of Indianapolis, Ind., has secured the contract for 9,000 sq. yds. of bitulithic on Fall Creek Boule. and 16,200 sq. yds. on Northwestern Ave.

Bedford, Ind.—Bids will be received until Aug. 22 by the Common Council for furnishing materials and improving portions of J, 15th and 16th Sts., by grading, curbing and paving with vitr. brick or block; W. M. Denniston, City Clk.

**Danville, Ind.*—The Comrs. of Hendricks and Marion Counties are stated to have awarded the contract for constructing Frazee gravel road to the Boone County Constr. Co. for $6,467 and the Gladden road to J. M. Little for $8,256.

**Iowa City, Ia.*—The contract for paving with bitulithic has been relet to Wm. Horrabin of Iowa City, Ia., a licensee of Warren Bros. Co.

**Centerville, Ia.*—The following are the bids opened on July 26 for paving about 3 miles with brick. The foundation will be 5-in. Portland cement 1½ sand cushion, Portland cement filler. The bids were submitted on two sections, and the Davenport Constr. Co. secured the contract for both sections. (*a*) Magden & Sheeley, Des Moines, (*b*) McCarthy Improv. Co., Davenport, (*c*) John O. Jones, Racine, Wis. (*d*) Davenport Construc. Co., Davenport. (Engineers, Iowa Eng. Co., Clinton.)

State and Maple Sts.

	9,665 sq. yds. paving.	7,400 lin. ft. 5x18 cement curb.	250 cu. yds. extra excav.	Total.	Brick used.
a	$1.75	$.34	$.35	$19,517	Oskaloosa brick.
b	1.63½	.42	.37	18,978	Purington.
c	1.81½	.36	.40	20,306	Capitol City, Des Moines.
**d*	1.58½	.37	.30	18,122	Purington.

Drake Ave. and other streets.

	49,375 sq. yds. paving.	22,000 lin. ft. 5x18 cement curb.	2,740 lin. ft. 6x20 cement curb.	1,060 cu. yds. extra excav.	Total.	Brick used.
b	$1.63½	$.42	$.45	$.27	$91,487	Purington.
c	1.81½	.36	.40	.44	99,098	Capitol City, Des Moines.
**d*	1.58½	.37	.40	.30	87,813	Purington.

Topeka, Kan.—City Engr. McCabe is stated to have submitted estimates to the City Council for resurfacing a portion of Kansas Ave. as follows, with brick $56,705 and with asphalt $65,808.

**Atchison, Kan.*—The Atchison Paving Brick Co., of Atchison, has secured the contract for paving Mound St. (bids opened Aug. 7) for a total of $13,133. It bid for 5,280 sq. yds. 2-course brick on 2-in. sand foundation, $1.25; 8,300 cu. yds. grading, 34 cts., and 3,200 lin. ft. cement curb., 35 cts.

**Jersey City, N. J.*—Geo. T. Bouton, Clk. Bd. St. and Water Comrs., writes in regard to paving with asphalt (bids opened Aug. 7) that the Uvalde Asphalt Co. secured the contract for paving Ege, Lexington and Yale Aves., 10,028 sq. yds. at 85 and 87 per cent. of the standard cost, and the Barber Asphalt Co. for Williams Ave., 4,710 sq. yds. at 82.8 per cent. of the standard.

Upper Marlboro, Md.—Bids will be received until Aug. 22 by the Road Comrs. (J. W. P. Somerville, Supt.) for grading and macadamizing about 2 miles of road in this county.

**Boston, Mass.*—Contracts for state highways (bids opened Aug. 3) have been awarded as follows: roads in Monson, to O. T. Benedict, Pittsfield, for $4,061; roads in Deerfield, to Hammond & Walsh, of Pittsfield, $3,807, and roads at Stoughton, Edw. J. Rourke, of Abington, $5,236.

Bids will be received until Aug. 19 by Maj. John Baxter, Q. M., U. S. A., 170 Summer St., Boston, for frunishing materials for grading and for constructing macadam roads and concrete walks at Ft. Warren.

Springfield, Mass.—The following bids are reported to have been opened on Aug. 3 for 12,000 sq. yds. of bituminous macadam pavement: Mr. Malette, of Geneva, N. Y., $1.74. Barber Asphalt Paving Co., $1.99½, and Warren Bros. Co., $2.25 (price given per sq. yd.).

**Cambridge, Mass.*—A contract for 15,000 sq. yds. of bitulithic on Cambridge St., has been awarded to the Warren Bros. Co.

**Somerville, Mass.*—Warren Bros. Co. of Boston has secured the contract for 5,000 sq. yds. of bitulithic in Somerville.

Wyandotte, Mich.—Bids will be received until Aug. 18 for grading, curbing and paving a portion of Biddle Ave., separate bids to be submitted on brick, asphalt, bitulithic, asphalt block, tar macadm, kreadone block, and cedar block on a concrete foundation and brick on a gravel foundation. H. O. Maloch, City Clk.

Detroit, Mich.—Bids will be received until Aug. 17 by the Dept. Pub. Wks. (J. J. Haarer, Comr.) for furnishing material, erecting and equipping ready for operation a plant for the making of brick for paving purposes, to be owned and operated by the city. Bidders are to submit their own plans and specifications and for plants of 20,000 and 30,000 capacity respectively.

**Lansing, Mich.*—Contracts for brick paving (bids opened July 31) have been awarded as follows: To Frank Farrell, of Lansing, for Grand and Walnut Sts., 5,525 sq. yds., $5,764, and to W. H. McKale, of Lansing, for Capital Ave., and Washtenaw St., 6,980 sq. yds., $6,848.

*The contract for paving a portion of Washington Ave. is stated to have been awarded to Dr. S. Champion for $7,584.

St. Joseph, Mo.—Rackliffe & Gibson, 619 Edmond St., are stated to have received the contract for macadamizing a portion of 19th St. at $5,861.

*The contract for macadamizing a portion of 18th St. is reported to have been awarded to Fred Roth at $1.20 per sq. yd.

**Kansas City, Mo.*—Sixth St. viaduct approaches will be paved with bitulithic, and the bridge with Acme asphalt, aggregating 50,000 sq. yds. and 36th St. 3,000 yds., the contract having been awarded to the Kansas Bitulithic Co.

Omaha, Neb.—The City Council is stated to have approved the estimate of City Engr. Beal for repaving with brick block 24th St. at $85,000.

Concord, N. H.—Bids will be received until Aug. 17 by A. W. Dean, State Engr., Concord, for road improvements in various towns throughout the State, to cost in all about $10,650.

Bayonne, N. J.—F. W. Dalrymple, City Surveyor, writes that the following are the bids opened on Aug. 1 for paving W. 26th St. from Ave. D to the Boule. with asphalt: (*a*) Uvalde Asphalt Paving Co., $10,877; (*b*) Barber Asphalt Paving Co., $11,466.

	a	*b*
1,310 lin. ft. straight curb	$.67	$.67
1,180 lin. ft. curb reset	.10	.15
432 sq. ft. bridge stone relaid	.07	.15
200 sq. ft. flag stone relaid	.03	.03½
5,500 sq. yds. asphalt paving	1.79	1.88

Jersey City, N. J.—Bids will be received until Aug. 14 by the Bd. Street and Water Comrs. (Geo. T. Bouton, Clk.) for paving about 3,103 sq. yds. with Belgian on Wright Ave., and 2,810 sq. yds. on Grace St.

**Items marked thus give the names of parties awarded contracts.*

**Cincinnati, O.*—The following are the bids opened on July 27 by the Bd. of Pub. Service for paving a portion of 2d St. with granite: (*a*) Henkel & Sullivan, $115,740; (*b*) G. M. Gest, $109,161; (*c*) Heffron Constr. Co., $115,179; (*d*) T. F. McClure Sons & Co., $100,210 (awarded contract); (*e*) Jas. Agnes, 103,658; (*f*) Wm. Fogarty, $103,207; (*g*) M. T. Flynn, $102,414; (*h*) L. Drach Constr. Co., $114,799; (*i*) T. P. Strack, $107,631, and (*j*) Veneble Bros. & Foster, $103,353.

	a	*b*	*c*	**d*	*e*	*f*	*g*	*h*	*i*	*j*
150 cu. yds. concrete	$4.90	$6.00	$5.00	$5.00	$3.50	$5.00	$4.00	$5.00	$6.00	$6.00
4,000 lin. ft. granite crossings	1.24	1.20	1.15	1.10	1.00	1.00	1.04	1.20	1.00	1.10
400 lin. ft. 5-in. granite curb	1.24	1.30	1.25	1.30	1.20	1.15	1.04	1.30	1.20	1.10
200 lin. ft. 5-in. granite circular curb	2.00	2.10	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
500 lin. ft. 5-in. redressed and reset curb	.25	.25	.30	.25	.20	.20	.15	.25	.25	.30
7,000 cu. yds. grading	.44	.10	.50	.01	.01	.01	.20	.40	.40	.55
32,000 sq. yds. granite paving	3.21	3.10	3.20	2.85	3.00	2.96	2.89	3.20	3.00	2.82
64 manhole tops, new square	14.00	12.00	14.00	12.00	10.00	12.00	12.00	18.00	12.00	5.00
400 lin. ft. crossings, redressed and reset	.40	.27	.30	.30	.10	.20	.15	.30	.40	.50
27 Palmer inlets	55.00	35.00	40.00	35.00	35.00	40.00	40.00	35.00	45.00	40.00
100 lin. ft. 12-in. drain pipe	1.00	1.25	1.50	1.00	1.00	1.50	1.00	1.00	1.50	1.00

**Seattle, Wash.*—The following are the bids opened on July 29 by the Bd. of Pub. Wks. for regrading 3rd Ave. and other streets (bidders all of Seattle): *a* International Contract Co., $53,577; *b* Stirrat & Goetz, $50,933; *c* C. J. Erickson, 502 Globe Bldg., $42,552 (awarded contract); *d* H. W. Hawley, $47,897.

	a	*b*	**c*	*d*
Fixed estimate	$3,000.00	$3,000.00	$3,000.00	$3,000.00
Clearing and grubbing (lump sum)	2,435.00	5,000.00	3,000.00	2,000.00
111,000 cu. yds. earthwork	.34	.27	.25	.29
250 cu. yds. concrete reaining wall	6.50	7.00	6.00	8.00
4,000 lbs. iron	.05	.06	.05	.10
54 lin. ft. 8-in. pipe sewer	1.20	2.00	1.10	1.30
2,860 lin. ft. 10-in. pipe sewer	1.50	2.00	1.25	1.50
1,620 lin. ft. 12-in. pipe sewer	1.80	2.25	1.40	1.60
13 manholes	50.00	70.00	50.00	60.00

Harrison, N. J.—Bids will be received by the Com. of Streets and Highways of the Common Council (C. J. Witt, Chmn.) until Sept. 5 for furnishing materials and paving a portion of Hamilton St. Approximate quantities: 7,600 lin. ft. 12-in. Telford pavt.; 2,200 sq. ft. of trap rock or brick gutters; 3,200 lin. ft. 4 x 20 curb; 600 sq. ft. new bridgestone, etc. C. Melville Borrie, Town Surveyor, 788 Broad St., Newark.

Ft. Hancock, N. J.—Bids will be received until Sept. 1 by Abe S. Bickham, Q. M., for constructing macadam roadways and concrete sidewalks here.

**Ashville, N. C.*—Three streets in this city will be paved with bitulithic, a contract for 15,000 sq. yds. having been awarded to the Warren Bros. Co.

**Cincinnati, O.*—Contracts have been awarded for bitulithic to the Warren Bros. Co., and licensees, on E. Court St., Washington Ave., and 8 other streets, in all 74,503 sq. yds.

*Bids will be received until Sept. 5 by the Bd. Co. Comrs., (Geo. C. Zimmerman, Clk.) for $50,000. Toll Pike Purchase bonds.

Bids will be received until Aug. 21 by the Bd. Pub. Service (Geo. F. Holmes, Clk.) for furnishing material and improving a portion of Pleasant St. by grading, curbing and paving with brick, and also on Sept. 5 for furnishing material and paving with bitulithic on a portion of Mound and Celestial Sts.

Lancaster, O.—It is reported that bids will be received by the Bd. Pub. Service until Aug. 15 for paving with brick on a concrete foundation on Mulberry St.

**Newark, O.*—The contract for paving and curbing a portion of Locust St. is stated to have been awarded to W. S. Pace, for $15,568.

Cleveland, O.—See "Water."

Findlay, O.—Bids will be received until Aug. 28 by Wm. Demland, City Aud., for $14,000 Washington St. improvement bonds.

Cleveland Heights, O.—Bids will be received until Aug. 29 by Wm. G. Phare, Village Clk., for furnishing material and grading a portion of Mayfield Road, also for furnishing material and paving with macadam on a portion of Euclid Heights Boule.

Portsmouth, O.—Bids will be received until Aug. 29 by the Bd. Pub. Service (John M. Wendelken, Clk. pro tem.) for furnishing materials and improving portions of 5 streets, by grading, curbing and paving with hard-burned or vitr. brick, asphalt, asphalt block or tar macadam. Approximate quantities: 32,464 sq. yds. paving, 11,626 lin. ft. straight curb., 837 lin. ft. circular curb., 16,620 sq. ft. sidewalks relaid, 1,591 lin. ft. of 24, 20, 18, 15 and 12-in. D. S. sewer pipe; 2,443 lin. ft. 20, 18, 15 and 12-in. sewer pipe; 61 catchbasins, 18 manholes, etc. R. A. Bryan, Engr.

Sandusky, O.—J. W. Miller, City Engr., writes that bids will be received on Aug. 14 for paving Campbell St. 9,259 sq. yds. with brick, sheet asphalt, block asphalt or bitulithic.

Columbus, O.—Bids will be received until Sept. 5 by the Bd. Co. Comrs. for furnishing materials and macadamizing the roadway on the west approach to the 5th Ave. Bridge over the Olentangy River in Franklin and Clinton Townships; also reflooring the sidewalks and paving the roadway of the bridge over the Olentangy River on 5th Ave. in the City of Columbus; L. E. Jones, Co. Aud.

Panama.—The following are the bids opened on Aug. 5 by the Isthmian Canal Comn., at Washington, D. C., for furnishing 4,000,000 paving brick: (*a*) for paving brick per M; (*b*) alternate bid for paving block, per M; Mack Trading Co., Pittsburg, Pa., *a* $27.30, *b* $42.50; Linden & Molo, Dubuque, Ia., *a* $30, *b* $37; Coffeeville Vitrified Brick Co., Indianpolis, Ind., *a* $30.14, *b* $34.16; Barr Paving Co., Streator, Vt., *a* $30.20, *b* $38.25; American Trading Co., of New York, (blocks from Metropolitan Brick Co., Canton, O.) *b* $40; Peoples Paving Co., Portsmouth, O., *a* $30.70, *b* $37.60; Federal Clay Products Co., Pittsburg, Pa., *a* $27.30, *b* $42.50.

**Hollidaysburg, Pa.*—The Standard Bitulithic Co., of Philadelphia, Pa., has secured the contract for 10,000 sq. yds. of bitulithic.

**Mauch Chunk, Pa.*—The Standard Bitulithic Co. of Philadelphia has secured the contract for 15,000 sq. yds. of bitulithic in Mauch Chunk.

Glassport, Pa.—Bids will be received until Aug. 16 by the Street Com. (Geo. Pforsich, Chmn.) for grading, curbing and paving a portion of Vermont Ave. P. S. McMullen, Boro. Engr.

**Pittston, Pa.*—O'Brien & Dunn are stated to have received the contract (bids opened Aug. 3) for paving with Mack brick on a portion of Broad St., at $2.12 per sq. yd.

**Valley Forge, Pa.*—J. O. Clarke, Engr., 906 Crozer Bldg., Philadelphia, writes that the contract for constructing stone roads in Valley Forge Park, bids opened Aug. 4 by the Valley Forge Park Comn., has been awrded to Wm. H. Doyle, of Berwyn.

Washington, Pa.—O. K. Taylor, Jr., City Engr., writes that the borough is thinking of buying about 500,000 brick for paving this year. It is also proposed to lay about 3,000 ft. of pipe sewers.

Spartanburg, S. C.—The citizens are stated to have voted to issue $100,000 bonds for street improvements.

Memphis, Tenn.—It is stated that bids will be received until Aug. 15 by W. B. Armour, City Register, for furnishing material and improving a portion of Mississippi Ave. and Main St.; the work includes approximately: 42,000 cu. yds. excav., 21,850 cu. yds. retaining wall, 1,075 cu. yds. of arch, 1,736 cu. yds. of abutments, 5,500 sq. yds. brick paving, 3,980 lin. ft. granite curbing, 30,700 sq. ft. sidewalks (granolithic), and 1,450 lin. ft. 18-in. storm sewer.

Seattle, Wash.—Bids willl be received until Aug. 19 by C. B. Bagley, Secy. Bd. Pub. Wks., for the following work: N. 39th St., grading, estimated cost $11,650; Ross Pl., grading, $14,000; E. Jefferson St., concrete walks, cost $2,350, and Northlake Ave., concrete walks, cost $55,000.

*J. A. Bailey, of Seattle, has secured the contract for wooden sidewalks, bids opened by Bd. of Pub. Wks., on Aug. 5 at the following detail bid: Fixed estimate, $1,500; 8,000 cu. yds. earthwork, $18; 1,660 M. ft. wooden sidewalks, etc., $14.50; 195 M. ft. crosswalks, $14; 2,000 lin. ft. 8-in. culverts, 65 cts.; 1,000 lin. ft. 10-in. culverts, 75 cts.; 200 lin. ft. 12-in. culverts, 75 cts.. 60 M. ft. planking, old lumber, $4; 137 M. ft. bulkhead, lumber, $18; 23,000 lbs. bulkhead, iron, 6 cts., and 2,000 lin. ft. railing, 15 cts.; total $36,410. The only other bid received was that of Wm. Stanley & Co. of Seattle, for $41,562.

**Tacoma, Wash.*—The Geo. M. Savage Co., California Bldg., is stated to have received the contract for constructing cement sidewalks in Local Improv. Dist. No. 244 for $13,360.

**Milwaukee, Wis.*—Jackson, Wells and Clayborne Sts. will be paved with bitulithic, a contract for 14,300 sq. yds. having been awarded to the Central Bitulithic Paving Co., of Detroit, Mich.; according to press reports the cost of the work will be $31,207.

Marinette, Wis.—It is reported that bids will be received until Aug. 16 for paving with vitrified brick on a concrete foundation on certain streets. Jacob W. Itjit, Clk. Bd. Pub. Wks.

Madison, Wis.—It is stated that bids will be received until Aug. 30 for paving with asphalt about 20,000 sq. yds. about the capitol square. John D. Icke, City Engr.

**London, Ont.*—The Warren Bituminous Paving Co. of Toronto has secured the contract to pave Richmond St. with bitulithic.

**Ottawa, Ont.*—The Warren Bituminous Paving Co. of Toronto has secured contracts aggregating 24,300 sq. yds. of bitulithic to be laid in Pape, Bain and Wellington Aves. and Bleeker St.

Toronto, Ont.—Bids will be received until Aug. 15 by Mayor Thos. Urquhart, Chmn. Bd. Control, for paving with asphalt on D'Arcy St., with bitulithic, on Frederick St. and with macadam on Teraulay and Edward Sts.; for concrete curbing on Teraulay and Edward Sts., and for constructing walks on portions of several other streets.

POWER PLANTS. GAS AND ELECTRICITY.

Notes Arranged Alphabetically by States.

Ensley, Ala.—The City Council is reported to have defeated the resolution to call an election to vote on issuing bonds for a municipal electric light plant.

Douglas, Ariz.—The Douglas Improvement Co. is reported to have decided to double the capacity of its water system and improve the electric lighting service.

Anaheim, Cal.—C. A. Copeland, of Los Angeles, is stated to have submitted to Council a report on improving and enlarging the water works and electric light plant; he estimates the cost at $40,000.

**Denver, Colo.*—The Bd. of Supervisors on Aug. 3 passed the ordinance granting the Denver Gas & Electric Co. a 5-yr. contract for lighting the streets with 50-c.p. lights.

Suisun, Cal.—The Suisun Light & Power Co. (Leonard Prior, owner) contemplates a general development of the lighting and power business.

Wallingford, Conn.—C. E. Thompson & Son is reported to have purchased the Wallingford Gas Light Co. and will within a short time make some extensions to the plant in order to further increase its capacity for furnishing gas for lighting and heating purposes. Ralph T. Ives will continue as president of the company.

Washington, D. C.—Bids will be received until Aug. 29 by the Bureau of Supplies and Accounts, Navy Dept., Washington, for furnishing and installing 3 water-tube boilers and machinery for the power house at the Naval Hospital, Washington.

Bids will be received until Aug. 22 by the Bureau of Supplies and Accounts, Navy Dept., for furnishing at the Navy Yards, etc., Portsmouth, N. H.; Boston, Mass.; Newport, R. I.; New York, N. Y.; League Island, Pa.; Washington, D. C., and Norfolk, Va., certain supplies, including electrical supplies, incandescent lamps, carbons, insulating tape, wire, testing set, generating set, projector, brass and steel conduit and fittings, chain cables, copper, brass, Portland cement, lime, paving brick, iron pipe, pipe fittings, etc.; also on Sept. 5 for furnishing at the Navy Yards, Puget Sound, Wash., and Mare Island, Cal., insulators, generating sets, roofing, moulding machine, steel iron, pipe, fittings, valves, etc. H. T. B. Harris, Paymaster Gen., U. S. N.

Jacksonville, Fla.—The following are the bids opened on Aug. 4 by the Bd. of Trus. Water Wks. and Improv. Bonds for furnishing a motor generator set of about 300-kw. capacity; (*a*) Synchronous motor set; (*b*) alternate bid for induction motor set: Crocker-Wheeler Co., Ampere, N. J., *a* $6,925, *b* $7,600; General Electric Co., Schenectady, N. Y., *a* $6,073, *b* $5,430; Electric Machine Co., Minneapolis, Minn., *b* $7,035; Ft. Wayne Electric Co., Ft. Wayne, Ind., *a* $5,623, *b* $5,331; Allis-Chalmers Co., Cincinnati, O., *a* $7,713; Westinghouse Electric Co., Pittsburg, Pa., *a* $6,671, *b* $5,380, and National Electric Co., Milwaukee, Wis., *a* $6,700.

Pensacola, Fla.—Bids will be received until Aug. 29 by the Bureau of Supplies and Accounts, Navy Dept., Washington, D. C., for furnishing at the Navy Yard, Pensacola, electrical supplies, incandescent lamps, pig iron, galvanized sheet steel, sheet lead and copper, brass and iron pipe, etc.

St. Augustine, Fla.—Thos. R. Osmond and associates are stated to have applied for a franchise for the St. Johns Light & Power Co., which proposes manufacturing gas, electricity or other illuminants for light and power and to construct and operate electric railways.

**Lagrange, Ga.*—Ludwig & Co., of Atlanta, are reported to have secured the contract for constructing the municipal electric light plant for Lagrange.

**Monroe, Ga.*—The Electric Supply Co., of Savannah, is stated to have secured the contract for constructing the municipal electric light plant (bids opened July 31) for about $20,000.

Winder, Ga.—It is proposed to install at the city electric light plant a 30-kw. a.-c. generator, switchboard, etc. D. W. Robertson, Supt.

Bloomington, Ill.—The Peoples Gas, Electric & Htg. Co. will probably rebuild the plant in the course of a year. J. N. Moncrieff, Supt., Bloomington.

Chicago, Ill.—Bids will be received until Aug. 17 by Wm. Carroll, City Electrician, for furnishing this city with 1,000, more or less, enclosed series alternating arc lamps, with the necessary transformers and regulators.

Shepley, Rutan & Coolidge, 84 Van Buren St., are reported to be preparing plans for the enlargement of the Hyde Park plant of the Commonwealth Electric Co.; probable cost of work is $150,000.

Clayton, Ill.—It is proposed to purchase at once a 60-kw. alternator for the municipal electric light plant. I. M. Brown, Supt.

Ottawa, Ill.—The Ottawa Power Co. is reported incorporated with a capital of $5,000. Jas. A. Sheldon is one of the incorporators.

Columbus, Ind.—The Columbus Street Ry. & Light Co. contemplates constructing power house and machinery, extensions to street railway and electric light system and also addition of a heating plant. R. F. Gottschalk, Pres.

Frankfort, Ind.—It is proposed to add one 120-kw. a.-c. generator to the city electric light plant. J. T. Small, Supt.

Muncie, Ind.—Among the improvements contemplated by this city is reported to be the rewiring of the city electric lighting system and the purchase of 100-ft. stacks. Harry L. McCullough, Supt.

New Harmony, Ind.—This city expects to install enclosed arc lamps at the city electric light plant. Thos. J. Phillips, Supt.

Noblesville, Ind.—The S. M. Smith Co., owners of the electric light plant, propose changing from open arc to enclosed, d.-c. 6.6 ampere and rebuild pole lines. O. N. Eiler, Mgr.

North Vernon, Ind.—It is proposed to install at the city electric light plant before the fall an additional 150-kw. unit and boiler. A. B. Berkshire, Supt.

Jasonville, Ind.—It is reported that the Jasonville Electric Light Co. (H. L. Hyatt, Pres.) will receive bids for the construction of an electric light plant.

Peru, Ind.—Saml. Murdock and associates are reported to have secured a franchise for a gas and central heating plant.

Rushville, Ind.—The Rushville Gas Co., of Rushville, has been incorporated, to manufacture and sell illuminating and fuel gas; capital $150,000. Alfonso L. Riggs, Wm. Harris and Owen L. Carr are the incorporators.

Worthington, Ind.—The Indiana Water & Light Co. (F. L. Good, Supt.) contemplates installing new arc light system, the adoption of meters and the extension of lines.

Chickasha, Ind. Ter.—The Chickasha Light & Power Co. (C. E. Ross, Mgr.) proposes installing a 250-hp. Corliss engine, a 150-hp. boiler, brick building, and repairs and additions to its lines.

Albia, Ia.—The Albia Electric Light & Power Co. has just started day current, and is in the market for small d.-c. motors, ½ to 25 hp., 110 and 220 volts. A. R. Jackson, Purchasing Agent.

Bedford, Ia.—The Bedford Light, Heat & Power Co. (M. L. Burt, Pres.) proposes installing 2 new 60-cycle alt. generators, one of 40-kw. and the other 100-kw. capacity.

**Items marked thus give the names of parties awarded contracts.*

Cascade, Ia.—The Cascade Electric Light & Power Co. expects to install a gas or oil engine. D. M. Finley, Pres.

Denison, Ia.—The Denison Electric Light & Power Co. contemplates installing a 50 or 60-kw. unit and a boiler.

Eldora, Ia.—It is reported that the Eldora Electric Light Co. will make extensive improvements to its plant.

Keokuk, Ia.—A prospectus is on file at the office of The Engineering Record, 114 Liberty St., New York, N. Y., containing information and data of the proposed dam to be constructed across Mississippi River by the Keokuk & Hamilton Water Power Co., to develop electric power at the foot of Des Moines Rapids and transmit same to cities in the States of Iowa, Illinois and Missouri. It is proposed to develop a minimum of 60,000 hp.; probable cost of proposed work is $6,000,000. John N. Irwin, Pres., Keokuk; R. R. Wallace, Secy., Hamilton, Ill., and Lyman E. Cooley, Consulting Engr., Chicago, Ill.

Madrid, Ia.—It is stated that the Madrid Electric Light & Power Co. wants figures on putting in storage batteries large enough to carry lights after 12 o'clock, and also carry a day current. W. Zenar, Ch. Engr.

Alpha, Ill.—The Tri-County Light & Power Co. expects soon to extend its lines to North Henderson and Viola. W. I. Taze, Mgr.

Garden City, Kan.—The Garden City Electric Co. will soon add to its equipment a 75-kw. dynamo and 100-hp. Corliss engine.

Hays City, Kan.—The Hays City Electric Light & Power Co. proposes installing a 65-kw., 1,100-volt alternator.

Lincoln, Kan.—A committee is reported to have been appointed, including A. Marshall, J. Albert Smith and others, to investigate and report on the question of constructing water works and an electric light plant.

Ottawa, Kan.—F. A. Sharpe, of Lawrence, is stated to have petitioned for a franchise for an electric light plant.

Middlesborough, Ky.—The Middlesborough Electric Light, Heat & Power Co. may possibly move its plant to the water works; if not it is proposed to place a dynamo at present station and a motor at the water works station. The company would like information about cost of iron poles and underground conduit. Address W. M. Todd, Mgr.

Waterville, Me.—The Messelonskee Electric Co. is reported to have in contemplation the development of another water power. W. Wyman, Mgr., Waterville.

**Baltimore, Md.*—The United Electric Light & Power Co. is reported to have awarded contracts for the equipment of its power station at Westport as follows: 10 boilers of 700 hp. ea. to the Babcock & Wilcox Boiler Co., of New York. 4 engines of 3,000 hp. ea., and overload capacity of 4,500 hp., to the McIntosh & Seymour Co., of Auburn, N. Y., and 4 generators of 2,000-kw. capacity ea. and overload capacity of 59 per cent., to the General Electric Co., of Schenectady, N. Y. The building, contract for which will soon be let, will be 1 story, 255 x 110 ft. Between the water front and the building will be extensive coal-storage yards, in addition to the bunker storage provided in the building. A gantry crane 275 ft. long will span the distance between the building and the water front to pick up and carry coal.

Lonaconing, Md.—The Lonaconing Electric Light & Power Co. expects to put in a 90-kw. dynamo in the near future. Wm. Atkinson, Mgr. and Purchasing Agent.

Gloucester, Mass.—The Gloucester Electric Co. proposes ading to its equipment a 500-kw. Curtiss steam turbine. W. H. Jordan, Pres., Gloucester.

**Springfield, Mass.*—Bartlett, Hayward & Co., of Baltimore, Md., have secured the contract for erecting a gas holder of 2,000,000 cu. ft. capacity, for the Springfield Gas Co.

Adrian, Mich.—The Citizens' Light & Power Co. (J. H. Fee, Pres.) contemplates installing a 500-hp. turbine and boiler outfit.

Cass City, Mich.—Surveys are now being made looking to the construction of a dam for the municipal electric light plant, about 4 miles southwest of Cass City, on Cass River. If report is satisfactory the water-power plant will be built next spring, for which a new set of dynamos, motors, and motor power pumps will be needed. Wm. N. Strube, Supt. and Ch. Engr.

Detroit, Mich.—C. Hayward Murphy, of the Murphy Power Co., writes that it is proposed to construct a power house for the generation of electricity and steam; also a cold-storage warehouse. J. F. Lewis is Supt. and Engr.

The Public Lighting Comn. (H. P. Hetherington, Pres.) will within one year install one 2,000-kw. unit.

Marshall Mich.—P. A. Mumaw, Village Recorder, writes that probably nothing will be done this year toward improving the water works and electric light plant.

Mason, Mich.—A new boiler, engine, a.-c. dynamo, switchboard and connections are needed for the municipal electric light plant. R. E. Darling, Supt.

Austin, Minn.—The City Council is stated to have granted John R. Howie and T. J. Gates, of Brooklyn, Ia., and T. H. J. Leckband, of Mason City, Ia., a 25-yr. franchise to install a gas plant in Austin.

Marshall, Minn.—It is proposed during the coming year to remodel the entire equipment of the municipal electrical light plant. E. Simmons, Supt.

Rushford, Minn.—The Secretary of the Rushford Power Co. writes that the proposed work contemplated by this company will cost about $18,000. D. J. Tew, C. H. Grier, J. Webster and others are among the parties interested.

Grenada, Miss.—The improvements contemplated at the municipal electric light and water plant are reported to include the purchase of 2 new generators. B. C. Adams, Mayor.

Gloster, Miss.—This city is reported to have in contemplation the installing of duplicate dynamos and engine within 12 months at the city electric light plant. Howard E. Pigford, Mgr.

Houston, Miss.—Bids will be received until Sept. 1 by J. M. Griffin for $13,500 water and light bonds.

Sardis, Miss.—The Panola Electric Light & Power Co. (A. W. Shands, Pres.) expects about Jan. 1 to put in series arc light circuit for street lighting.

Cape Girardeau, Mo.—The Cape Girardeau Water Wks. & Electric Light Co. (Thos. Fox, Supt.) will construct new gas plant this fall.

**Farmington, Mo.*—The Bd. of Mgrs. of State Hospital No. 4 for the Insane is reported to have awarded contracts for the following improvements (bids opened July 31): Alterations to dining-room, power-house and laundry, J. W. McCarthy, of Farmington, $17,327; additional equipment to power-house, Urbauer-Atwood Htg. Co., of St. Louis, $14,000, and sewerage system, H. D. Hallett, of Aurora, Ill., $12,791.

Joplin, Mo.—The Spring River Power Co. write that it is proposed to construct a new power plant. Engineers, the Arnold Co., of Chicago, Ill.

St. Louis, Mo.—Bids will be received until Aug. 15 by the Bd. Pub. Improv. (W. B. Dryden, Secy.) for furnishing the electricity for the electric lighting of the building in Dist. No. 1, requiring about 140,000,000 watt-hours, also in Dist. No. 2 requiring 210,000,000 watt-hours.

Butte, Mont.—Saml. T. Hauser, of Helena, former governor of Montana, is reported interested in the construction of a second dam across Missouri River. It is proposed to transmit the power generated at this dam to Anaconda.

Ft. Omaha, Neb.—Bids will be received until Aug. 21 by Maj. M. Gray Zalinski, Constr. Q. M., Army Bldg., Omaha, for an electric lighting system at Ft. Omaha.

Atlantic Highlands, N. J.—At the municipal electric light plant, it is expected to change the arc to alt. enclosed, and change the alt. to 2,000 primary and 60 cycles, with new dynamo and engine. F. E. Price, Supt.

Raton, N. M.—The City Council is reported to have granted J. Morrow, Jere. Leahy and T. B. Hart a franchise for a gas plant.

Far Rockaway, L. I., N. Y.—Bids will be received until Aug. 21 by C. B. J. Snyder, Supt. School Bldgs., N. Y. City, for installing electric equipment in School No. 39, Far Rockaway, Boro. Queens.

Lowville, N. Y.—The Wetmore Electric Co. proposes installing a 500-kw. alternator and a pair of water wheels. L. Wetmore, Mgr., Lowville.

Penn Yan, N. Y.—The Yates Electric Light & Power Co. proposes rebuilding and installing two 400-hp. Victor turbines, horizontal type, direct connected to two 150-kw. generators.

Morganton, N. C.—W. A. Mauney, of Kings Mountain, and J. M. Torrence ,of Morganton, are reported to have decided to organize a company to construct an electric light plant and erect a cotton factory.

Fayetteville, N. C.—Electric light bonds amounting to $30,000 are reported sold.

Raleigh, N. C.—The Raleigh Electric Co. proposes constructing 2 miles of railroad and extending the lighting system. W. J. Andrews, Pres. & Mgr.

Ada, O.—The Ada Water, Heat & Light Co. (B. S. Young, of Ada, Secy. and Mgr.) will require about 10 miles of construction material for its extension to Algiers.

Carey, O.—At the village electric light plant it is proposed to add a 75-kw. a.-c. generator and a separate engine for the arc lights. Harry C. Fink, Mgr.

Oberlin, O.—The Oberlin Gas & Electric Light Co., of Oberlin, has been incorporated with a capital of $10,000 by W. B. Whiting, C. F. Brooks, A. J. Sperry and others.

Strasburg, O.—Contracts are being let by the Strasburg Electric Co. (Jacob Denzer, Supt.) for doubling the capacity of the plant.

Toledo, O.—It is reported that Frank I. Consaul, Ch. Engr. Bd. of Pub. Service, estimates the cost of constructing a municipal electric light plant at $470,400.

Hughesville, Pa.—The Citizens Electric Light & Power Co. (John B. Fox, Secy.) is preparing plans for a power plant.

Hyndman, Pa.—The Hyndman Electric Light, Heat & Power Co. (N. A. Blair, Pres.) expects to install a larger engine in the near future.

Lock Haven, Pa.—The Electric Light Co. is reported to have in contemplation the enlargement of its plant on E. Church St.

Mahanoy City, Pa.—The Mahanoy City Light, Heat & Power Co. (Wallace Haldeman, Mgr.) will shortly install a 300-hp. water-tube boiler.

Philadelphia, Pa.—Bids will be received until Aug. 15 by Sheldon Potter, Dir. Dept. Pub. Safety, for furnishing electric arc lights for the year 1906.

Reading, Pa.—The Reading Illuminating Co., 532 Washington St., is reported to be making preparations to construct a power plant and install the necessary equipment in the way of wires, cables, conduits, etc.

The Reading Illuminating Light Co. has been incorporated with a capital of $100,000, to supply light, heat and power in Reading. Directors: Gustav Ulbricht, of Brooklyn, N. Y.; Ralph W. Gifford, of New York, N. Y., and Danl. J. Driscoll, of Reading.

Shamokin, Pa.—The Shamokin Light, Heat & Power Co. expects to replace its present machinery with 600-kw., 60-cycle, 2,200-volts, 2-phase, a.-c. generators.

Somerset, Pa.—The Somerset Electric Light, Heat & Power Co. proposes adding a 300-kw. alternator and a 600-hp. engine. J. M. Bricker, Mgr.

Tremont, Pa.—The Tremont & Pine Grove Electric Light & Power Co. proposes extending its system to Pine Grove, 6 miles, and to Donaldson, 1 mile. Geo. Bernd, Supt.

Weatherly, Pa.—The Town Council is reported to have decided to construct a new electric light plant.

Williamsport, Pa.—The Lycoming Electric Co. is reported to have decided to lay a system of conduits for underground wires in connection with the building of its proposed new power plant on Hepburn St. Ernest H. Davis, Mgr.

Womelsdorf, Pa.—Wm. H. Dechant, 536 Penn St., Reading, is reported to be preparing plans for the construction of an electric light plant at Womelsdorf.

Columbia, S. C.—The Columbia Electric Street Ry., Light & Power Co. (Edwin W. Robertson, Pres.) proposes installing a 240-kw. rotary, 2 mlies of new track and the necessary extension of lines.

Florence, S. C.—Bids will be received until Aug. 28 by Jas. Knox Taylor, Superv. Archt., Treas. Dept., Washington, D. C., for furnishing and installing in complete working order in the U. S. Post Office at Florence, certain combination gas and electric light fixtures.

Clarksville, Tenn.—The Queen City Electric Light & Power Co. (Wm. Case, Mgr.) proposes installing a 500-kw. Curtis turbine, a 200-kw., 3-phase, a.-c. generator; a 250-kw. motor generator set, new switchboard, 3 water-tube boilers, etc.

Jackson, Tenn.—See "Electric Railways."

Jefferson, Tex.—The Jefferson Ice, Light & Power Co. is reported to have decided to construct an electric light plant.

Salt Lake City, Utah.—The County Comrs. are reported to have granted Emil J. Raddatz, a franchise to construct and operate an electric transmission system to Bingham Junction and Sandy.

**Winchester, Va.*—E. Purcell & Co., of Harrisonburg, are reported to have secured the contract for constructing a dam, power house and raceway, along Shenandoah River, near Millville, for the Winchester & Washington City Electric Ry. Co., which is to be used for furnishing power for electricity in Winchester and other towns in this section.

Barnet, Vt.—The Pioneer Electric Co. (A. S. Hunt, Mgr.) proposes installing new water wheels this fall.

Burlington, Vt.—Bids will be received until Aug. 23 by Jas. Knox Taylor, Superv. Archt., Treas. Dept., Washington, D. C., for installing a conduit and electric wiring system for the U. S. Post Office and Custom House at Burlington.

Fond du Lac, Wis.—The Independent Light, Heat & Power Co. is reported incorporated with a capital of $25,000, by Robt. R. Freeman, G. R. Hoffman and Frank D. Fulton.

Florence, Wis.—The Pine River Improvement & Power Co. is reported incorporated, with a capital of $100,000, by E. W. Hopkins and E. A. Edmunds.

Janesville, Wis.—The Janesville Electric Co. proposes extending its system to Milton and Milton Junction. P. H. Korst, Mgr.

Madison, Wis.—The State Bd. of Control is reported to be considering the construction of an electric light plant at the Mendota State Hospital, to cost about $17,000.

Platteville, Wis.—The Platteville Electric Light & Power Co. will this fall add a 50-kw. generator and a 80-hp. engine, direct connected; beginning early in the year 1906 the company contemplates installing machinery to double the capacity of the plant. J. H. Evans, Secy.

Victoria, B. C.—The citizens are reported to have voted to issue $11,000 bonds for the purpose of increasing the capacity of the electric light plant.

Ingersoll, Ont.—The Ingersoll Electric Power & Light Co. proposes installing new boiler, station equipment, etc. H. Richardson, Mgr.

Napanee, Ont.—Bids will be received until Sept. 1 by W. A. Granger, Town Clk., for $35,000 electric light bonds.

W. A. Grange, Town Clk., writes that Mr. Kelch, of Montreal, Que., is now preparing plans and specifications for the proposed electric light plant, to cost about $35,000.

ELECTRIC RAILWAYS.

Notes Arranged Alphabetically by States.

New London, Conn.—The Norwich, Jewett City & Voluntown Electric Ry. Co. is reported organized. Lucius Brown, Albert L. Potter and Chas. E. Chandler, of Norwich, are reported interested.

St. Augustine, Fla.—See "Power Plants, Gas and Electricity."

Boise, Idaho.—The construction of an interurban railway is reported under consideration. Messrs. Ustick and Donaldson are reported interested.

Freeport, Ill.—The power plant of the Freeport Ry., Light & Power Co. is reported destroyed by fire.

Carlinville, Ill.—The Carlinville, Alton & St. Louis Ry. Co., of Jerseyville, is reported incorporated, the object being to construct and operate a railway from Carlinville to the east bank of the Mississippi River at Alton. Capital $2,000. Incorporators: Andrew W. Cross, Jos. M. Page, and John C. McGrath, of Jerseyville; Aaron O. Auten, of Chicago; June M. Rhoades, of Alton, and others.

Columbus, Ind.—See "Power Plants, Gas and Electricity."

Ft. Wayne, Ind.—Gen. Mgr. C. D. Emmons, of Ft. Wayne, and party, have looked over ground for extension of the line of the Ft. Wayne, Bluffton & Marion Traction Co. from Bluffton via Hartford City, Montpelier and Anderson to Alexandria, line to connect at Alexandria with the line of the Union Traction Co. for Indianapolis. Preliminary survey to start at once.

Evansville, Ind.—The County Comrs. are stated to have granted the Evansville & Mt. Vernon Electric Ry. the right of way from the boundary line along the roadway of the L. & N. R. R. to Tekopel Ave.

It is stated that the Evansville & Newberg Ry. Co. will build its branch to Booneville from Woodmere. The right of way has been secured, and the grading will begin in a few days.

Ft. Wayne, Ind.—The Muncie, Hartford City & Ft. Wayne Traction Co. is stated to have asked for a franchise to enter the city over Richardville Ave. It will have to build a bridge over the river for its own use.

New Castle, Ind.—The New Castle-Indianapolis Constr. Co. is reported to have filed articles of incorporation. Capital $50,000. The object of the company is to build the Indianapolis, New Castle & Toledo Traction line. LeGrand Marvin, R. B. Hernley, W. D. Oaks and others are directors.

La Grange, Ind.—The St. Joseph Valley Ry. Co. is reported to have filed articles of incorporation. Capital

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**Items marked thus give the names of parties awarded contracts.*

$400,000. The company proposes to construct an electric railway from La Grange to Angolia. The line will be 40 miles long. Directors: Herbert E. Bucklen, Chas. H. Winchester, A. H. Bardsley and others.

Rockport, Ind.—S. O. Graham is reported to be promoting the construction of an electric railway from a point on the Southern R. R. to White Sulphur Springs. The line will be 12 miles long.

Bangor, Me.—It is stated that the property and franchises of the Penobscot Central R. R. Co., which has been operating an electric railway from Bangor to Kenduskeag, Corinth and Charleston, will be taken over by the Bangor & Northern Co., which has been organized in Bangor. John R. Graham, Pres.; F. D. Oliver, Treas. Capital $150,000. Important improvements, it is said, will be made in the entire system at once.

Hagerstown, Md.—Official announcement has been made that the Hagerstown Electric Ry. Co. will begin at once the construction of an electric railway, 10 miles in length, from Hagerstown, connecting with the electric railway running from Greencastle to Waynesboro and Pen Mar, in Franklin County. It is estimated the road will cost, including equipment, at least $200,000. All preliminary surveys have been made. It has also been announced that the company proposed building an electric railway from Boonsboro to Sharpsburg, through Keedysville and Antietam battlefield, a distance of 6 miles.

Mayor Abraham C. Etrite, who is at the head of a syndicate organized to build an electric railway from Hagerstown to Waynesboro, a distance of 12 miles, states that the determination of the Hagerstown Ry. Co. to build a line into Franklin County will not deter his syndicate from going ahead with their enterprise. The two roads will practically parallel each other.

**South Haven, Mich.*—The Kalamazoo, Lake Shore & Chicago Traction Co. is stated to have awarded the contract for grading between South Haven and Bangor to W. A. Drake, of Kalamazoo. A branch will be built from the main line at Paw Paw to Lawton.

Menominee, Mich.—It is stated that a preliminary survey is being made for an electric line to connect Menominee and Escanaba via Marinette. John W. Well, of Menominee; Isaac Stephenson, of Marinette, and John K. Stack, of Escanaba, are reported to be promoting the line.

Jackson, Mich.—The Jackson Consolidated Traction Co. is reported to have decided to build a line to the city limits to meet the line of the Jackson & Lansing Traction Co.

It is stated that the Detroit, Ypsilanti, Ann Arbor & Jackson Ry. will change its route into the city next summer. The new route will give a loop for local service between Jackson and Jackson Junction.

Kalamazoo, Mich.—The Kalamazoo, South Haven & Chicago Traction Co. is stated to have secured the right of way for a branch line between Paw Paw and Lawton.

Vernon, Mich.—It is stated that J. H. Stephenson, of Philadelphia, and J. D. Leland, of Durand, have been granted a franchise for a street railway through Vernon. The road will also be built to Durand.

Kansas City, Mo.—The Council is stated to have granted a franchise to the Metropolitan St. Ry. Co. to build and operate a street car line on 13th St. The proposed line connects the Fifth St. and the Chelsea Park division.

Joplin, Mo.—A. Nelson, Pres. of the Wichita Electric Co., is reported interested in the construction of a railway to connect Joplin with Springfield, Mo. The line will pass through Aurora, Monett and Pierce City.

Montclair, N. J.—See "Railroads."

Brooklyn, N. Y.—The Williams Terminal Ry. Co. is reported incorporated, to build and operate an electric road in Brooklyn. The proposed route is to be from a point on Bowne St. to Imlay St., where it will connect with the tracks of the New York Dock Co., running southeasterly along Bowne St. to the property of J. H. Williams & Co., on Richards St. Capital $10,000. Dir.: Wm. C. Redfield, Jas. H. Williams, Albro T. Tilton, Hugh Aikman, of Brooklyn, and Benj. Whittaker, of. Manhattan, and others.

Hickory, N. C.—The Hickory Ry. & Power Co. is about to construct a city and interurban railway about 14¾ miles in length. The Thornton Light & Power Co., of Hickory, will furnish the power for the new line.

Raleigh, N. C.—See "Power Plants, Gas and Electricity."

Lorain, O.—The City Council is stated to have granted a franchise to the Lorain St. Ry. Co. for the extension of its line to the river, where connection will be made with the Avon Beach & Southern.

**Lima, O.*—The contract for the building of the link of the Lima & Toledo Traction Ry. is reported to have been let to L. E. Meyers & Co., of Chicago.

Oklahoma City, Okla. Ter.—The Oklahoma Electric Ry. Co., of Tecumseh, Okla. Ter., is reported incorporated, with $250,000 capital, to build 10 miles of electric railway out of Shawnee, in Pottawatomie County. Incorporators: Alfred Hare, E. H. Milburn, E. T. Fullerton, E. J. Dickerson and Chas. Blickenderfer.

Souderton, Pa.—The Souderton, Skippack and Fairview St. Ry. Co. is reported to be considering the use of gasoline as a motive power on the line which it expects to build between Souderton and Skippack. E. S. Moser, Pres.

Philadelphia, Pa.—The Germantown & Chestnut Hill Belt Line is reported to have asked Councils for permission to lay tracks which will cover nearly the whole of Germantown and Chestnut Hill.

**Erie, Pa.*—It is stated that the Bessemer Constr. Co., of Pittsburg, will build the new Erie, Cambridge, Union & Corry Electric Ry., which will be 42 miles long, and will pass through Langdon, Godard and Samson to Waterford, where a "Y" will be built. One branch will extend through Mill Village and Miller's Station to Cambridge Springs, and another from Waterford through LeBoeuf. It is estimated that the line will cost $800,000. J. M. Walker, Gen. Mgr. Senator P. A. Gibson, of Erie, Pres.

Greensburg, Pa.—Surveys for the extension of the lines of the West Penn Rys. Co. from Mt. Pleasant to Youngwood are in progress. The company recently purchased the Greensburg & Southern Electric Ry., which operates between Greensburg and Youngwood, and purposes coming into Greensburg over its own tracks in the near future. It is stated that the lines will be extended westward from Greensburg, possibly to McKeesport.

Somerset, Pa.—The Town Council is stated to have granted a franchise to the Pittsburg, Westmoreland & Somerset Ry. Co.

Waynesboro, Pa.—Surveys for the proposed Waynesboro-Hagerstown trolley line are reported to have been completed.

Chambersburg, Pa.—The Chambersburg, Greencastle & Waynesboro Electric Ry. Co. is stated to have decided to build the extension between Greencastle and Chambersburg. Surveys have been made of the route and estimates of the cost presented to the Bd. of Dir.

Harrisburg, Pa.—A charter is stated to have been granted to the Johnstown Terminal St. Ry. Co.. capital, $10,000. John G. Gilbert, Pres. Directors: Jas. C. Thompson, Jacob T. Snyder, Wm. S. Tunis, Edward Holbert and John G. Gilbert.

Sioux Falls, S. D.—J. F. Noel, of Chicago, is stated to have been granted a franchise to build an electric street railway system over the streets of Sioux Falls. A belt line will be constructed first through the business portion of the city, connecting Phillips and Main Aves. and 15th and 20th Sts.

Columbia, S. C.—See "Power Plants, Gas and Electricity."

Nashville, Tenn.—It is stated that the Nashville Interurban Ry. Co. (Maj. E. B. Stahlman, of Nashville, Pres.)) proposes to build a railroad from Nashville to Franklin, Columbia and Mt. Pleasant. It was formerly the purpose to make it an electric line, but the prospectus states that the gasoline power will be used. The charter gives the company the right to build and operate an interurban line to Gallatin, but this will not be taken up until the Franklin line is completed.

Jackson, Tenn.—The Jackson & Suburban St. R. R. Co. will expend about $100,000 for a central station and $100,000 for extension of street railway electric light and power lines, etc. John Wisdom, Supt.

Corsicana, Tex.—J. V. Watkins is stated to have made application to the City Council for a franchise for an interurban car line through the streets of the city of Corsicana.

Austin, Tex.—The Arlington Heights Traction Co., of Ft. Worth, is reported incorporated, with a capital of $250,000. Incorporators: L. C. Cole, C. E. Montgomery and Leroy A. Smith.

Winchester, Va.—See "Power Plants, Gas and Electricity."

Tacoma, Wash.—Promoters of the Puyallup Valley Electric Ry. announce that the line will be built between Tacoma and Puyallup on the south shore of the river, and that work will begin on the line within the next few days. Articles of incorporation will be filed within a week and that actual construction will be commenced just as soon as the company is incorporated. According to the latest plans, the road will enter Tacoma on 25th St., and will enter Puyallup on Pioneer Ave.

Racine, Wis.—The Milwaukee Electric Ry. & Light Co. is reported to be making surveys for an electric railway to be built within a year, from Muskego to Waterford.

Montreal, Que.—D. D. Mann, of the Canadian Northern Ry. Co., is stated to have purchased the St. Leon Springs Hotel, and it is understood will build an electric railway from the hotel to connect with the Great Northern Ry., about 6 miles.

Peterborough, Ont.—Surveys are reported to have been made under the direction of Wm. C. Heathcote, C. E., for proposed extension of the Peterborough Radial Ry. from Peterborough to Young's Point, about 14 miles.

Victoria, B. C.—The British Columbia Electric Ry. Co. is stated to have plans completed for the extension of its line from Stevenson to Westminster Junction.

Calgary, N. W. T.—The Calgary St. Ry. Co. is stated to have in contemplation the construction of an electric street railway.

RAILROADS.

Notes Arranged Alphabetically by States.

Miami, Fla.—J. C. Meredith, Constructing Engr. Florida East Coast Ry. Co., writes that no contract was let on July 31 for the construction and completion of reinforced concrete arch work involving about 80,000 cu. yds. concrete on the proposed Key West extension between Long Key and Conch Key, but will be let on Sept. 9 with the other reinforced concrete work, of which there will be 45,000 cu. yds. at Knights Key Channel, 45,000 cu. yds. at Moser Channel and 35,000 cu. yds. at Bahia Honda.

Carrollton, Ga.—The Central of Georgia Ry. Co. (Henry M. Steele, Ch. Engr., Savannah) is reported to be surveying for a branch line in Carrollton, Bowden, Graham and Lamar, Ga., and Roanoke, Ala.

**Chicago, Ill.*—The Patton & Gibson Constr. Co., 302 House Bldg., Pittsburg, Pa., is stated to have secured the contract for straightening curves and leveling the grades on the Chicago & Alton R. R. and providing for double-tracking the entire system between Chicago and Kansas City and Bloomington and St. Louis. It will involve the removal of over 2,000,000 cu. yds. of earth.

The Mississippi Valley & Gulf R. R. Co. is reported to have been organized in Chicago, Aug. 2, with W. I. Allen, Pres., and E. L. Gochanour, Secy. The company is incorporated in Iowa and all the western Mississippi Valley sates to the Gulf, with a capital of $50,000,000. It is planned to start the road from some point in Iowa on the Mississippi.

**Des Moines, Ia.*—The Rock Island R. R. Co. (W. L. Darling, Ch. Engr., Chicago, Ill.) is reported to have decided to expend about $2,000,000 during the present year on the improvement of its Iowa lines. Part of the principal work decided upon is the elimination of some curves near Des Moines, Casey and Avoca. The heavy grades east of Des Moines will be greatly reduced. On the main line of the southwest division, the track between Washington and Centerville will be straightened and improved. The main line is to be double-tracked from Iowa City to Valley Junction and other needed improvements are to be made.

Burnside, Ky.—The Cincinnati, Burnside & Cumberland River R. R. Co. is reported incorporated, with a capital of $250,000, to build a road from the lines of the Cincinnati Southern R. R. in Pulaski County, at Burnside Junction to Burnside Landing and Tateville, a distance of 4 miles. Incorporators: C. W. Cole and J. W. Hood, of Cincinnati, O.; M. F. Molloy, of Carthage, O.; Murray R. Hubbard, of Covington, Ky., and others.

Baltimore, Md.—Press reports state that the entire line of the Drum Point Ry. from Baltimore to Drum Point has been purchased by the Wabash R. R. Co. (W. S. Newhall, Ch. Engr., St. Louis, Mo.) for a deep-water terminal route.

Montclair, N. J.—Jas. Owen, 196 Market St., Newark, Engr. of Essex County, is reported to have prepared plans for constructing a trolley viaduct of steel and concrete over the Lackawanna tracks on Bloomfield Ave. to do away with the grade crossing at that point. The cost of depressing the railroad tracks and building a bridge to carry the roadway and the trolley tracks is estimated at $60,000, of which the Lackawanna R. R. (L. Busch, Ch. Engr., Hoboken) will pay one-half, and the balance will probably be paid for jointly by the trolley company and the county.

**Guymard, N. Y.*—The Erie R. R. Co. is reported to have awarded to Bennett & Talbot, of Greensburg, Pa., the contract for building the first section of 12 miles of the Guymard cut-off, including a tunnel of 5,300 ft. through Shawangunk Mountains. This section, extending from Howells to Guymard, N. Y., will be a double-track line, exclusively for use of freight, and will be 125 ft. below present Erie grade. This section calls for the expenditure of about $1,500,000. Contracts for the remaining 30 miles of the cut-off will, it is said, be awarded within a short time.

Albany, N. Y.—Press reports state that about $300,000 will be expended by the N. Y. Central & Hudson River R. R. Co. in the construction of a fifth track at places along the Western and Mohawk divisions of the road. F. A. Harrington, Div. Supt., Albany.

Portland, Ore.—Press reports states that E. H. Harriman, of New York, N. Y., Pres. Southern Pacific R. R. and other roads, will expend about $10,000,000 in railroad building in Oregon, Washington and Idaho within the next year.

Pittsburg, Pa.—Frank Sullivan Smith, 45 Wall St., New York, N. Y., formerly vice-pres. of the Pittsburg, Shawmut & Northern R. R. Co. is reported to have been appointed as receiver for the road, and it is said that plans are now under way to extend the line into Pittsburg and to Buffalo via Olean, N. Y.

Press reports state that the Pennsylvania R. R. Co. (W. H. Brown, Ch. Engr., Philadelphia) will extend the elevated tracks along Duquesne Way to the East End and to Braddock and beyond. Electricity will be used as the motive power. The plans include an extension of the elevated tracks down Ohio Valley as far as Sewickley.

**Philadelphia, Pa.*—The Philadelphia & Garrettford Passenger R. R. Co. is reported to have awarded the contract for grading and masonry of its proposed line from a connection with the Philadelphia & West Chester Traction Co., along Garrettford Road to Clifton, to the Nolan Constr. Co. of Reading. The grading and masonry will be for a double track, involving an expenditure of about $80,000. Contracts for the track laying and overhead work have not been let. The latter will probably, it is said, be done by the company.

Johnson City, Tenn.—The Clinchfield Corporation, which owns the South & Western R. R. (Geo. L. Carter, Pres., Bristol, Va.-Tenn.) is reported to have decided to build a railroad about 300 miles in length to its coal lands in Virginia.

Trinity, Tex.—Lamb & Hansen, of Trinity, have 20 miles of good dry work on the Beaumont & Great Northern R. R., and will let it to suit outfits, waste and barrow.

Sunnyside, Wash.—The Northern Pacific Ry. Co. (E. J. Pearson, Ch. Engr., St. Paul, Minn.) is reported to have filed with the Secretary of State at Olympia, a resolution of intention to construct a branch line about 20 miles in length to be known as the Sunnyside branch.

Casper, Wyo.—The Chicago & Northwestern Ry. Co. (E. C. Carter, Ch. Engr., Chicago, Ill.) is reported to have in contemplation the extension of the Casper-Lander line, across the State into Idaho and Salt Lake City, Utah.

**Vernon, B. C.*—McLean Bros., contractors of Vancouver, for the Okanogan Constr. Co. are reported to have signed contracts for the construction of the Vernon & Midway Ry., about 150 miles in length, between Vernon and Midway. It is stated that it is later proposed to build a line to Spokane to connect at Midway; the route from Vernon to Vancouver on the western end through the Hope Mountains is also reported to have been surveyed.

**Orizaba, Mex.*—The Governor of the State of Veracruz is reported to have approved a contract for the construction of a railroad between Orizaba and La Perla with T. Alfred Kennion by which he is authorized to construct a road, with the option of constructing several branches to neighboring points. The main line is to be of standard gauge, as also the branch lines with the single exception of the one to Texmala, which may be either narrow or standard gauge. Any motive power may be employed. A telegraph or telephone line is to be established and operated in connection with the road. The contract is for a term of 50 years, at the end of which time the road with all its stations, warehouses, and shops will become the property of the municipality of Orizaba, either by purchase or rental.

Portage la Prairie, Man.—Press reports state that bids will be received until Aug. 28 by the Grand Trunk R. R. (J. Hobson, Ch. Engr., Montreal, Que.) for the construction of about 275 miles of main line westward from this city.

PUBLIC BUILDINGS.

Notes Arranged Alphabetically by States.

Little Rock, Ark.—Bids will be received until Sept. 4 by the Bd. (John J. Fletcher, Chmn.) for erecting a hospital at the Confederate Home.

Washington, D. C.—Bids will be received until Aug. 21 by the Comr. of Fisheries, Dept. Commerce and Labor, for constructing an aquarium at the Bureau of Fisheries.

**Items marked thus give the names of parties awarded contracts.*

***Wallace, Idaho.*—August Ilse, of Spokane, Wash., it is reported, has received the contract to erect the court house and jail at $68,495.

Chicago, Ill.—The following are reported to be the bids received for removing the old court house building: Garden City Wrecking & Lumber Co., 50 days, $232,000; S. Krug Wrecking, Lumber & Iron Co., 90 days, $220,000; John Griffith & Son, 90 days, $179,000; W. M. Crilly, 90 days, $181,500; 120 days, $178,500; 160 days, $175,500; 180 days, $172,500; Chicago House Wrecking Co., 120 days, $205,000.

Chicago, Ill.—It is stated that the Trus. of the Danish Evangelical Lutheran Church of America intend erecting a 3-story brick orphan asylum on Evergreen Ave., to cost $16,000.

Rockford, Ill.—Winchester & Cullom, it is stated, submitted the lowest bid for erecting the city hall at $66,385.

Indianapolis, Ind.—It is stated that bids will be received by Vonnegut & Bohn, Archts., Indian Trust Bldg., for erecting the Methodist Episcopal Hospital and Deaconess Home on Capital Ave.

Terre Haute, Ind.—It is reported that the Finance Com. has recommended the issuing of $45,000 bonds for the erection of a fire house.

South Bend, Ind.—The Bd. of Pub. Wks. (W. A. McInerney, Pres.) has decided to erect 2 new brick hose houses, with metal roof, etc.

Mt. Pleasant, Ia.—The erection of a court house at a cost of $75,000 is reported under consideration.

Manhattan, Kan.—The County Clerk writes that bids will be received until Oct. 5 for the construction of a court house, to cost about $45,000. Architect, J. C. Holland, of Topeka.

Baltimore, Md.—It is stated that the Centre Market Comn. is about to ask bids for erecting the fish market. Simonson & Pietsch, Hoen Bldg., are the Archts.

Ft. Washington, Md.—Bids will be received by Lieut. Willis C. Metcalf, U. S. A., on Aug. 24, for repairs and alterations to construction work proper, at the hospital at Ft. Washington, as advertised in The Engineering Record.

Farmington, Mo.—See "Power Plants, Gas and Electricity."

Jefferson City, Mo.—The following are reported to be the bids received July 31 for erecting the new Supreme Court Bldg.: (*a*) Boonestone; (*b*) Cape Girardeau, (*c*) Carthage; (*d*) Phoenix; (*e*) Bedford; (*f*) Ste Genevieve; (*g*) Keener: Samuel & Burden, *a* $357,037; *b* $356,037; *c* $357,877; *d* $357,377; *e* $330,337; *f* $352,037. Hill-O'Meara Constr. Co., *a* $311,000; *b* $305,000; *c* $300,000; *d* $300,000; *e* $280,500; *f* $277,500. E. Steininger, *a* $369,200; *b* $373,200; *c* $345,200; *d* $357,200; *e* $322,608; *f* $329,198; *g* $392,290. Morrison Constr. Co., *a* $342,200; *b* $349,000; *c* $345,000; *d* $353,000; *e* $309,977; *f* $329,000; *g* $327,000. Collins Bros., *c* $315,000; *e* $306.000.

Adrian, Mich.—The following are the bids opened on Aug. 7 by the Superv. Archt., Treas. Dept., Washington, D. C., for the construction complete of U. S. Post Office at Adrian: E. W. Reid & Co., Flint, $28,603; King Lumber Co., Charlotteville, Va., $37,333; W. J. Turner, Chicago, Ill., $33,693; C. F. Matthews, Adrian, $33,538; W. J. McAlpine, Dixon, Ill., $38,000; C. W. Gendele, Chicago, Ill., $37,000, and D. H. Hayes & Co., Chicago, Ill., $36,641.

Newberry, Mich.—Charlton & Kuenzli, of Milwoukee, Wis., are preparing plans for a 2-story brick and stone building which is to be erected at the Upper Peninsula Hospital for the Insane, Newberry. Cost, $30,000.

Pontiac, Mich.—It is reported that plans are being prepared for an $80,000 addition to be erected at the Eastern Michigan Asylum for the Insane.

***Duluth, Minn.*—It is stated that O. G. Olson has secured the contract to erect the federal building here at $167,700.

Ft. Robinson, Neb.—Bids will be received until Aug. 17 by Thos. Swobe, Acting Ch. Q. M., Omaha, for constructing a set of quarters for sergeant hospital corps at Ft. Robinson.

Jersey City, N. J.—Bids will be received until Sept. 7 by the Bd. Trus. of the City Hospital (Jos. A. O'Connor, Secy.) for furnishing material and erecting a hospital and power house on Baldwin Ave. Bids will be received on the entire work or separately on the general construction, ventilating and heating, plumbing, gas fittings, etc., elevator work, etc., and electrical work. Clinton & Russell, Archts., 32 Nassau St., N. Y. City.

New York, N. Y.—Bids will be received until Aug. 18 by Wm. McAdoo, Police Comr., for furnishing materials and installing new steam boilers and heating systems, complete, in various police station houses.

Bids will be received until Aug. 21 by Wm. McAdoo Police Comr., for furnishing material and making repairs to the House of Detention, training stable, and several police stations.

Bids will be received until Aug. 21 by Thos. W. Churchill, Deputy and Acting Fire Comr., for furnishing material and installing the plumbing, gas and electric systems in the Bldg. of Engine Co. No. 23, Boro. Manhattan.

Bids will be received until Aug. 18 by Jas. H. Tully, Comr. Dept. Pub. Charities, for furnishing material nd erecting a dormitory at the Metropolitan Hospital, Blackwell's Island; also for the plumbing and drainage of same.

Brooklyn, N. Y.—The following are the bids opened on Aug. 3 by the Comrs. of Parks, N. Y. City, for furnishing and erecting the Parade Ground Building on Parade Ground, parallel with Coney Island Ave., Brooklyn Boro. (Bidders of Brooklyn, unless otherwise mentioned): Thos. G. Carlin, 215 Montague St., $71,499; Geo. F. Driscoll, 391 Fulton St., $76,472; Richard E. Henningham, 4 Court Sq., $73,478; Geo. Hildebrand, 38 Park Row, N. Y. City, $73,940; F. J. Kelly's Sons, 215 Montague St., $84,987; Jas. MacArthur, 32 Ormond Pl., $105,707; Danl. J. Ryan, 723 3rd Ave., $68,800, and Ryan & McFerran, 106 E. 23d St., N. Y. City, $69,475.

The Armory Bd. has adopted a resolution approving the plans and specifications for the addition to the 13th Regt. Armory, and appropriated $100,000 to defray the costs.

Bids will be received until Aug. 17 by the Park Bd. (John J. Pallas, Pres.), New York City, for furnishing materials and erecting a boat house in Prospect Park, Boro. Brooklyn.

Ft. Schuyler, N. Y.—Bids will be received until Sept. 14 by the Light House Engr., at Tompkinsville, for furnishing material and constructing the Throgs Neck Light House at Ft. Schuyler, as advertised in The Engineering Record.

Cincinnati, O.—See "Miscellaneous."

Portsmouth, O.—It is reported that plans are being prepared for a $75,000 hospital, to be erected at Islington St. and Robinhood Ave., by Dr. Wm. J. Gillette.

Sandusky, O.—It is reported that bids will be received until Aug. 24 for erecting a hospital for the Ohio Soldiers' and Sailors' Home. Gen. J. W. R. Cline, Comdg.

Oklahoma City, Okla. Ter.—E. S. Blackburn, Co. Clk., writes that the citizens voted Aug. 1 to issue $30,000 bonds for the erection of a county jail.

Enid, Okla. Ter.—A. A. Crowell, of Enid, is reported to be preparing plans for the court house, for which the citizens recently voted to issue $100,000 bonds.

***Allentown, Pa.*—Fissel & Wagner, of New York, N. Y., have secured the contract for constructing complete the U. S. Post Office at Allentown (bids opened May 31) for $74,781.

***Dixmont, Pa.*—Rose & Fisher, of Allegheny, it is stated, have received the contract to erect a hospital building here for the Western Pennsylvania Hospital for the Insane.

Philadelphia, Pa.—Building permits have been issued as follows: To Appleton & Burrell, 1204 Chancellor St., to erect a 3-story brick charitable institute, 55 x 87 ft., at 26th and Lombard Sts., 7th Ward, cost $35,000; John R. Wiggins & Co., 1215 Filbert St., a 1 and 2-story brick hospital additions, 42 x 85 ft., at Broad and Ontario Sts., 37th Ward, cost $35,000; Wm. R. Dougherty, 1604 Sansom St., 3-story brick dormitory, 75 x 38 ft., s. s. Spruce St., 27th Ward, cost $40,000, and Burd P. Evans, 706 N. 9th St., for a building to cost $35,000, for the German Baptist Home for the Aged in 2d St. Pike, south of Princeton Ave. It will be a 2-story structure of stone, 38 x 149 ft.

Bids will be received until Aug. 23 by the Comrs. of the Homeopathetic State Hospital for the Insane (Wm. P. Snyder, Secy.), at the office of the archt., 1826 Land Title Bldg., for erecting buildings for said hospital at Hanover Township, Lehigh Co. Plans and specifications may be obtained at the office of the Archt., on the deposit of $200.

Bids will be received until Sept. 9 by Lieut. Col. R. L. Hoxie, Corps Engrs., U. S. A., for constructing a dwelling, oil house, barn, etc., at the Reedy Island Range, Rear Light Station, Del.

Pittsburg, Pa.—Neal & Rowland, 215½ 4th Ave., it is stated, have prepared plans for 2 wings to be erected at the South Side Hospital at a total cost of about $125,000. Each wing is to be 5 stories high, 42 x 77 ft.

***Wernersville, Pa.*—A. P. Spatz, of Wernersville, it is reported, has received the contract to erect a dormitory at the State Asylum for Chronic Insane at South Mountain, Wernersville, the cost to be about $20,000.

Winchester, Va.—The Common Council has approved the plans for the Handley Library, which is to be erected at a cost of $200,000.

Columbia, S. C.—Architects Edwards & Walter, of Columbia, write that bids will probably not be called for until next year, for the proposed $60,000 court house for Columbia. W. H. Seale, Supervisor.

Bremerton, Wash.—The following are the bids opened on Aug. 5 by the Bureau of Yards and Docks, Navy Dept., Washington, D. C., for extension to joiner shop, for construction and repair Bldg. No. 91, Navy Yard, Puget Sound, Wash.: Congress Constr. Co., Chicago, Ill., $20,500; T. Ryan, 28 Sullivan Bldg., Seattle, $17,900; J. H. Randall, 322 Coleman Bldg., Seattle, $19,320; Puget Sound Bridge & Dredging Co., Seattle, $21,950.

Ft. Flagler, Wash.—Bids will be received until Aug. 25 by Geo. H. Penrose, Constr. Q. M., U. S. A., Pt. Townsend, Wash., for constructing boiler room and installing heating plant in Administration Bldg.; also same date for converting hospital into subsistence storehouse, both at Ft. Flagler.

BUSINESS BUILDINGS.

Notes Arranged Alphabetically by States.

Ash Fork, Ariz.—The Atchison, Topeka & Santa Fe Ry. Co. (Jas. Dun, Ch. Engr., Chicago, Ill.), it is stated, will erect a $75,000 passenger station here.

San Francisco, Cal.—W. P. Fuller & Co. will erect a warehouse, 120x275 ft., to cost about $100,000. Wright & Polk, archts., 124 Sansome St.

Canon City, Colo.—The Canon City Hot Springs Sanatorium Assoc., it is stated, has been incorporated with a capital of $200,000 for the purpose of erecting a sanatorium here. Dr. P. A. Wade, Pres.

Denver, Colo.—The Bd. of Directors of the American Mining Congress, it is stated, have decided to erect a mining temple here, to cost about $250,000.

***Wallace, Idaho.*—A. J. Olson, of Wallace, it is reported, has secured the contract to erect the Eagles Hall at $17,890.

Sterling, Ill.—The Pabst Brewing Co. of Milwaukee, Wis., it is stated, will erect a 3-story brick building on Locust St., to cost about $25,000.

Chicago, Ill. — Henry L. Ottenheimer, 109 Randolph St., is preparing plans for a warehouse which is to be built at 1609 Prairie Ave. for S. W. Strauss & Co. The building will be 4 stories high, 50x161 ft., of brick and stone, and cost about $50,000.

The Bosworth Bros. Express, Van & Storage Co. will erect a 3-story storage warehouse at Wentworth Ave. and 61st St., 60x127 ft., and cost $45,000.

H. J. Schlacks, Borden Blk., is preparing plans for a tannery to be built at 734 N. Halsted St. for S. J. Eisendrath & Co. The main building will be 2 stories high, 50x74 ft., and will cost $40,000.

The Birchwood Country Club has secured a site on Chase Ave., and will erect a clubhouse; cost, $20,000. Henry Wittekind, 128 E. Jackson Boule., archt.

The old Academy Theatre on Halsted St., near W. Madison St., is to be remodeled at a cost of about $20,000.

Marshall Field, Robt. T. Lincoln and Frank O. Lowden, it is stated, are interested in the erection of an 18-story office building at Adams St. and Michigan Ave., on the site of the Pullman Bldg.

It is reported that the Chicago & Northwestern R. R. Co. (E. C. Carter, Ch. Engr., Chicago, Ill.) will erect a $40,000 station at Kenzie Ave.

***Peru, Ind.*—Architects Crapsey & Lawrie, of Cincinnati, O., write that J. B. Goodall, of Peru, has the general contract for erecting a $50,000 building for Caffery & Sullivan. Contracts for elevators, steam heating and plumbing are not yet let.

Terre Haute, Ind.—It is reported that the Central Union Telephone Co. has purchased a site at 7th and Ohio Sts. and will erect a 3-story office building, estimated to cost $30,000.

Crawfordsville, Ind.—It is stated that the Knights of Pythias will build a $30,000 temple in this city. Ed. Voris, Chmn. Bldg. Com.

Davenport, Ia.—The Davenport Club House, it is stated, has filed articles of incorporation for the purpose of erecting a club house for the Commercial Club, the cost of the building to be about $75,000.

Sioux City, Ia.—The Massachusetts Realty Co., it is stated, has purchased a site at 4th and Jackson Sts., and will erect a $50,000 business building.

Des Moines, Ia.—The C. L. Percival Co., it is stated, has purchased a site at First and Walnut Sts., and will erect a warehouse at a cost of $25,000.

Manhattan, Kan.—Holland & Squires, of Topeka, it is stated, have been engaged to prepare plans for the Y. M. C. A. bldg., which it is proposed erecting at a cost of $30,000.

Louisville, Ky.—It is stated that Henry Besten intends erecting a store and apartment building at Baxter and Highland Aves., at a cost of about $50,000.

***Bangor, Me.*—H. P. Cummings Co., 131 State St., Boston, has secured the contract for erecting a passenger station in Bangor for the Maine Central R. R., for about $80,000.

***Baltimore, Md.*—The Armored Concrete Co., it is stated, has secured the contract for the concrete work on the Professional Bldg., at about $20,000.

*Chas. Gilpin, of Philadelphia, Pa., it is stated, has secured the contract to erect an 8-story building at Hanover and Baltimore Sts., for Isaac Hamburger.

Simonson & Pietsch, Baltimore American Bldg., it is stated, have been engaged to prepare plans for a 7 or 8-story fireproof building for Henry Sonneborn & Sons, which is to be erected at Pratt and Paca Sts., at a cost of about $300,000.

*A contract has been awarded J. Hiltz & Son, 3 Clay St., for the construction of a 2-story brick store at 118 E. Baltimore St.; cost, $45,000.

Austin, Minn.—The Hormel Packing Co., it is reported, will erect a 5-story addition to its building at a cost of $40,000.

Beatrice, Neb.—It is stated that the Burlington R. R. (G. W. Holdrege, Gen. Mgr., Omaha), intends erecting a passenger station here, to cost, including grounds, $50,000.

Hoboken, N. J.—The entire Hoboken terminal of the Delaware, Lackawanna & Western R. R., the Duke Hotel and 2 piers have been destroyed by fire.

Brooklyn, N. Y.—The Clarke Realty Co., it is stated, is having plans prepared for an 8-story fireproof storage warehouse which is to be erected at Fulton St. and Glenada Pl., at an estimated cost of $300,000.

Ellis Island, N. Y. H., N. Y.—The Central R. R. of New Jersey, the Pennsylvania, the Lackawanna, the Ontario and Western, the West Shore and other railroad systems are reported to have appointed a commission to have charge of the construction of an immigrant railroad station on Ellis Island, which will cost about $200,000. It is stated that the Commission will soon meet and call in engineers to decide on the point where the new station will be erected.

Niagara Falls, N. Y.—A building permit has been issued for a roundhouse, which is to be erected for the N. Y. Central & Hudson River R. R. in the North End yards, at a cost of about $175,000.

***Fargo, N. D.*—Chas. J. Allen, General Secy. Y. M. C. A., writes that the contract for general construction of the Y. M. C. A. building (bids opened Aug. 1) has been awarded to Bowers Bros., of Fargo, for $39,990. Contract for heating, plumbing and wiring not yet let.

Lima, O.—The Lima Electric Ry. & Light Co. (Wm. Diehl, Ch. Engr., 214 N. Elizabeth St.) it is stated, intends erecting a station on N. Main St. and Grand Ave., to cost $30,000.

***Cincinnati, O:*—It is reported that the Cincinnati Zoological Co. has awarded the contract to erect the herbivora to the Collier Bridge Co., of Cincinnati, the cost to be about $30,000.

Cleveland, O.—C. J. Grammer, of Chicago, Ill., vice-pres. of the Lake Shore & Michigan Southern R. R., it is stated, has announced that a union station is to be erected in this city. The plans include besides the station, the building of an elevated railway entirely across the city, the equipping of a part of the Lake Shore with electricity, probably between Cleveland, O., and Buffalo, N. Y., and the building of a connecting line between the Oil City Road of the Lake Shore and the soft coal road of the N. Y. Central; $5,000,000 has been appropriated for these improvements.

*John Grant & Son, it is stated, have secured the contract to erect a 4-story building on Huron St., 23x132 ft., for Herman Kelley, to cost $20,000.

Columbus, O.—It is reported that the Central Telephone Co. has directed Richards, McCarthy & Bulford, Ruggery Bldg., to prepare plans for a 7-story building to be erected at 3d and Linn Aves., at an estimated cost of $225,000.

McKeesport, Pa.—The business men, it is stated, intend erecting an arcade building on 5th Ave., to cost $100,000.

Philadelphia, Pa.—A building permit has been granted to Fred A. Havens & Co., 418 Perry Bldg., to erect a 3-story brick factory, 45x105 ft., on Carpenter St., 2d Ward; cost, $22,000.

*Doyle & Doak, 1509 Sansom St., it is stated, have secured the contract to erect a 2-story fireproof office building at Broad and Walnut Sts.

**Items marked thus give the names of parties awarded contracts.*

*Geo. A. Glenn & Co., 930 N. 8th St., is is stated, have secured the contract to erect a 3-story stable at 3431 N. Broad St., for Edw. Salter, at $25,000.

**Pittsburg, Pa.*—Architect J. L. Beatty, 6th St. and Penn Ave., has awarded to Kerr & Fox the contract to erect a 5-story brick warehouse and office building at 1427 Liberty Ave.; cost, $20,000.

Plans are being prepared by Jas. T. Steen, Smith Blk., for the additional story to be built on the Smith block, Liberty Ave. and 6th St., at a cost of $50,000.

*The contract for the 5 brick warehouses which Chas. McKnight is to erect at 21st St. and Liberty Ave., has been let to A. & S. Wilson Co., 543 3d Ave.; cost, $44,000.

*The Geo. A. Fuller Co., of N. Y. City, it is stated, has secured the contract to erect a 19-story granite and terra cotta office building on 4th Ave. and Wood St. Approximate cost, $600,000.

**Beaver Falls, Pa.*—It is reported that the Nicola Bldg. Co., of Pittsburg, has secured the contract to erect a roundhouse here at about $50,000.

Nashville, Tenn.—It is reported that David Belasco, of N. Y. City, is considering the erection of a theatre here at a cost of $200,000.

Knoxville, Tenn.—It is stated that Bauman Bros., archts., 612½ Gay St., will soon ask bids for erecting a brick addition to the Empire Bldg., at a cost of $30,000.

Chattanooga, Tenn.—It is stated that the Southern Ry. Co. (D. W. Lum, Ch. Engr. M. of W. and Structures, Washington, D. C.) intends erecting a new passenger station at 11th and King Sts.

Memphis, Tenn.—Chighizola, Hanker & Cairns, Scimitar Bldg., it is reported, have completed plans for a station at Linden St. Estimated cost, $300,000.

**Houston, Tex.* — Architects Sanguinet & Staats, of Houston, write that the contract for erecting a 5-story steel office bldg. (bids opened July 25) has been awarded to C. C. Wenzel, of Houston, for $76,700.

**Ft. Worth, Tex.*—J. T. Taylor, of Dallas, it is stated, has secured the contract to erect the theatre here for the International Amusement Co., the cost to be about $60,000.

The Arlington Heights Co., it is reported, has accepted plans for erecting the hotel at a cost of $125,000. S. G. Dankersley, mgr.

**Seattle, Wash.*—Geo. Driver, it is stated, has secured the contract to erect a 4-story addition to the Stone, Fisher & Lane's store; the cost to be about $100,000.

*The International Fireproof Constr. Co., it is stated, has secured the contract for the reinforced concrete work on the Burke Bldg., at $23,000, also the contract for the reinforced concrete work, $300,000, on the American Savings Bank & Trust Co.'s Bldg.

Geo. Kennear, it is stated, has been granted a building permit to erect a 2-story brick business building at 401 Pike St., to cost $25,000.

Isaac T. Cook, it is reported, represents St. Louis capitalists who intend erecting a 10-story hotel in this city, and have $650,000 available for the construction of same.

J. H. Schack, Downs Bldg., it is stated, is preparing plans for a natatorium which is to be erected on Eagle St. and Western Ave., at a cost of about $100,000.

A. Warren Gould, of Boston, Mass., it is stated, has prepared plans for an 8-story fireproof building, 109x120 ft., which is to be erected for the Standard Furniture Co., at 2d Ave. and Pine St.

Racine, Wis.—It is reported that the Jones-O'Brien Amusement Co. will erect a $25,000 theatre here.

La Crosse, Wis.—W. F. Gage, mgr. of the La Crosse Theatre, it is stated, has announced that plans have been prepared for remodeling the theatre at a cost of about $40,000.

Hamilton, Ont.—Bids are wanted until Aug. 21 for erecting a modern office building (fireproof) for the Bank of Hamilton; Chas. Mills, Archt., 2½ James St.

New York, N. Y.

20 Cherry St., 3-story br. and stone storage and stable bldg.; c, $20,000; o, Annie C. Rockafeller; a, Jas. T. Slevin.

234 E. 104th St., 2 6-story br. and stone stores and tenements; total c, $60,000; o, Max Lipman; a, Horenburger & Straub.

Ave. D and 9th St., 6-story br. and stone store and tenement; c, $50,000; o, Jos. Wolkenberg; a, Geo. F. Pelham.

130 W. 17th St., 9-story br. and stone loft bldg.; c, $150,000; o, Middleboro Realty Co.; a, Edwin Wilbur.

13 W. 24th St., 11-story br. and stone store and loft bldg.; c, $185,000; o, Andrew J. Kerwin; a, Frederick C. Zobel.

115 E. 29th St., 6-story br. and stone loft bldg.; c, $75,000; o, Hudnut Realty Co.; a, Henry I. Cobb.

326 E. 49th St., 6-story br. and stone store and tenement; c, $50,000; o, Max Gold; a, horenburger & Straub.

56th St. and 12th Ave., 1-story br. and stone foundry and storage bldg.; c, $20,000; o, The City of New York; a, Alex. Stevens.

Elton Ave. and 155th St., 2 6-story br. tenements and stores; total c, $97,000; o, Philip Freudenmacher; a, Chas. Baxter & Son.

Westchester and Wales Ave., 5-story br. stores and tenement; c, $50,000; o, Monfried & Brener; a, Moore & Landsiedel.

Lexington Ave. and 66th St., 10-story br. and stone studio apartment bldg.; c, $700,000. o, The East 66th St. Studio Bldg Co.; a, B. H. Simonson and Pollard & Steinam.

CHURCHES AND DWELLINGS.

Notes Arranged Alphabetically by States.

Ft. Wayne, Ind.—A. B. White, it is reported, will erect a 3-story apartment house at Berry and Webster Sts., at a cost of $80,000.

Louisville, Ky.—The proprietors of the Weissinger-Gaulbert apartment house, it is reported, intend erecting a 5-story addition to the building, at a cost of about $110,000. Mr. Howe, Mgr.

Minneapolis, Minn.—John Lund will erect a 2-story brick dwelling at 1,771 Colfax Ave., to cost $15,000.

St. Louis, Mo.—The members of the St. Margaret R. C. Church, it is reported, intend erecting a new edifice at a cost of $70,000. Rev. J. J. O'Brien, Pastor.

Carthage, Mo.—It is reported that the congregation of the M. E. Church (South) has decided to erect a $20,000 edifice. E. T. Hardaway, Clk. Bldg. Com.

New York, N. Y.—St. Thomas's Episcopal Church, at 5th Ave. and 53d St., has been destroyed by fire.

Rochester, N. Y.—Rev. Horace A. Crane, pastor of the Glenwood Methodist Church, it is stated, has announced that a $20,000 addition is to be erected to the edifice.

**Philadelphia, Pa.*—Henry P. Schneiger, 9th and Tioger Sts., it is stated, has secured the contract to erect the St. Luke's Methodist Church at a cost of about $23,000.

Pittsburg, Pa.—Price & McLanahan, Archts., of Philadelphia, have prepared plans for the $40,000 residence to be erected for J. J. Turner, of the Pennsylvania R. R. Co., at Amberson Ave. and Westminster Pl., Shadyside.

Beaver Falls, Pa.—Leonard Strub, of Beaver Falls, it is stated, is contemplating the erection of a 3-story apartment house, 100 x 100 ft., of brick and stone, estimated to cost $30,000.

**Sparta, Wis.*—It is reported that G. S. Schneider, of Arcadia, has secured the contract to erect a R. C. Church here at a cost of about $19,000.

New York, N. Y.

Monroe and Catherine Sts., 6-story br. and stone tenement; c, $25,000; o, Cohen & Kraft; a, M. Zipkes.

96th St. and Lexington Ave., 6-story br. and stone tenement; c, $38,000; o, Goodman & Rubins; a, Bernstein & Bernstein.

95th St. and Park Ave., 3 6-story br. and stone tenements; total c, $135,000; o, Samuel Mandel; a, Rouse & Sloan.

202 E. 103d St., 6-story br. and stone tenement; c, $45,000; o, Julius Weinstein; a, Bernstein & Bernstein.

112th St. and 1st Ave., 2 6-story br. and stone tenements; total c, $80,000; o, Giuseppe Muler; a, Moore & Landsiedel.

428 E. 117th St., 6-story br. and stone tenement; c, $43,000; o, Morris Fine; a, Bernstein & Bernstein.

123d and Park Ave., 6-story br. and stone tenement; c, $40,000; o, Wallach & Trattler; a, Bernstein & Bernstein.

1646 Amsterdam Ave., 5-story br. and stone tenement; c, $25,000; o, Louis & Kosuth Ungrich; a, Henry Andersen.

Central Park West and 86th St., 12-story br. and stone apartment house; c, $950,000; o, Gotham Bldg. & Constr. Co.; a, Mulliken & Moeller.

139th St. and Lenox Ave., 6-story br. and stone tenement; c, $50,000; o, Frederick H. Nadler; a, Eugene J. Stern.

144th St. and Lenox Ave., 2 6-story br. and stone tenements; total c, $100,000; o, Maskin & Hyman; a, Bernstein & Bernstein.

160th St. and Bway, 4 5-story br. and stone tenements; total c, $140,000; o, Roosevelt Realty & Constr. Co.; a, Saml. Sass.

163d St. and Amsterdam Ave., 6-story br. and stone tenement; c, $60,000; o, Henry T. Bulman; a, Neville & Bagge.

166th St. and Edgecomb Ave., 2 5-story br. and stone tenements; total c, $76,000; o, Polstein & Roeder; a, Geo. F. Pelham.

Amsterdam Ave. and 166th St., 6-story br. and stone tenement; c, $25,000; o, Isaac Schlesinger; a, Neville & Bagge.

Ft. Washington Rd. and Bway, 5-story br. and stone tenement; c, $42,000; o, Kuhn & Lawson; a, J. C. Cocker.

Old Bway and 129th St., 4 6-story br. and stone tenements; total c, $170,000; o, Gunn & Grant; a, Schwartz & Gross.

Charlotte and 170th Sts., 5 5-story br. tenements; total c, $200,000; o, Fleichman Realty Co., a, Geo. F. Pelham.

Kelly St. and Prospect Ave., 5-story br. tenement; c $75,000; o, Prospect Ave. Realty Co.; a, Moore & Landsiedel.

Simpson and Freeman Sts., 6-story br. tenement; c, $42,000; o, Harris Ratner; a, John Hauser.

145th St. and St. Anns Ave., 4 6-story br. tenement; total c, $210,000; o, Brown & Lopin; a, Moore & Landsiedel.

148th St. and Morris Ave., 5-story br. tenement; c, $50,000; o, Avallone & Biondi; a, Moore & Landsiedel.

Beach and 150th Sts., 2 5-story br. tenements; total c, $80,000; o, Herman Lacherowitz; a, Goldner & Goldberg.

Brook Ave. and 163d St., 5-story br. tenement; c, $52,000; o, Arthur J. Collins; a, J. C. Cocker.

Bathgate Ave. and 174th St., 2 6-story br. tenements; total c, $80,000; o, Baum Realty Co.; a, Horenburger & Straub.

Prospect Ave. and 152d St., 2 5-story br. tenements; total c, $74,000; o, Louis Weinstein; a, Bernstein & Bernstein.

Stebbins Ave. and Freeman St., 5-story br. tenement; c, $40,000; o, Henson Powell Realty Co.; a, Hedman & Schoen.

Wendover and 3d Ave., 3 6-story br. tenements; total c, $90,000; o, Otto J. Schwarzler; a, Albert J. Schwarzler.

295 Rivington St., 2 6-story br. and stone tenements; total c, $76,000; o, Louis Reiner; a, Bernstein & Bernstein.

The Tree of Life, a Jewish society, it is reported, intends erecting a synagogue at a cost of $40,000. Henry Jackson, Trus.

SCHOOLS.

Notes Arranged Alphabetically by States.

**Washington, D. C.*—I. Pavarani, 814 18th St., n. w., it is stated, has secured the contract to erect the Industrial Home School for Colored Children at Blue Plains, at $59,000. The contract for the 7 cottages, it is stated, has not been awarded as yet.

**Quincy, Ill.*—Contracts, it is stated, have been awarded as follows for erecting a 12-room school in Franklin Sq.: George Lange, carpenter work, $16,594; Roeder & Greemann, excav. and stone work, $9,428; J. H. Konefes & Son, brick work, $8,690; Comstock-Castle Co., galvanized iron work, $1,315; Perry, Tenk & Co., plastering, $5,800; Sullivan Bros., heating and plumbing, $7,970; Central Iron Wks., steel and iron, $472; Miller & Butler, electrical wiring, $395.

**Des Moines, Ia.*—Weitz & Sons, 713 Mulberry St., it is stated, have received the contract to erect the parochial school on Univ. Ave. and 19th St., at $22,467.

*H. H. Barton, Univ. Ave. and 43d St., it is stated, has received the contract to erect the bible school at the Drake Univ., at about $33,000.

**Wichita, Kan.*—It is stated that Wood & Shuler have secured the contract to erect the men's dormitory at Fairmount College at $23,176.

Boston, Mass.—Bids will be received until Aug. 16 by the Schoolhouse Comrs. (R. Clipston Sturgis, Chmn.) for furnishing and delivering granite on the site of the proposed Charlestown High School, Monument Sq., Charlestown Dist.

Detroit, Mich.—The following are the lowest bids received on various parts of the work in connection with the erection of the Sill School: J. T. Mayhew, carpenter work, $17,347; I. E. Boomer, mason work, $14,887; Henry B. Lewis, iron work, $1,557; Wm. S. Piggins' Sons, cut stone, $1,424; Voight & Saxauer, slate and metal work, $3,911; John F. Jones, plumbing and sewerage, $1,810; Calnon & Goodall, plastering, $3,250; Jas. W. Partlan, heating and ventilating, $6,752; Johnson Service Co., heat regulation, $900; Detroit Stoker & Fdy. Co., automatic stokers, $645; Miller-Seldon Electric Co., electric wiring, $509.

It is stated that bids will be received until Sept. 1 by Malcolmson & Higginbotham, Archts., 404 Moffat Bldg., for erecting 4 2-story and basement schools, 100 x 50 ft., for the Bd. Educ. (Wm. J. Lee, Secy.); total cost, $200,000.

St. Clair Heights, Mich.—Bids will be received until Aug. 15 by the School Bd. of Fractional Dist. No. 10, Grosse Pointe, for erecting a brick addition to Public School on Montclair Ave., at this place. Jos. E. Mills, archt., 510 Washington Arcade, Grosse Pointe.

Duluth, Minn.—It is reported that bids will be received until Aug. 19 for erecting a dormitory at the State Normal School.

Minneapolis, Minn.—Plans are being prepared for a $250,000 building for the State Agricultural College at St. Anthony Park.

Red Wing, Minn.—It is reported that bids will be received until Aug. 18 for erecting a shop building for the hospital and guard house State Training School here.

Kosciusko, Miss.—Bids will be received until Aug. 22, at the office of S. P. Rimmer, Jr., Clk. Bd. of Mayor and Aldermen, for erecting an annex to the White Public School; W. M. Noah, Mayor.

St. Louis, Mo.—The congregation of the St. James R. C. Church, it is stated, is contemplating the erection of a school at a cost of $25,000.

Concord, N. H.—Plans prepared by Hill & James, of Boston, Mass., it is stated, have been accepted for the proposed high school, and those of Randlett & Griffin, of Concord, for the new W. Concord School.

Englewood, N. J.—Bids will be received by the Bd. Educ., until Aug. 21 (extension of date) for erecting a school. R. Jamieson, City Clk., Dean St.; Taylor & Mosley, Archts., 1 Nassau St., N. Y. City.

Newark, N. J.—Bids will be received until Aug. 15 (readvertisement) by the Com. on School Houses, Bd. Educ. (R. D. Argue, Secy.) for furnishing materials and performing the mason work required in the erection of the Avon Ave. School; Chas. P. Baldwin, Archt., 45 Clinton St.

Albion, N. Y.—The School Bd. is reported to be considering plans for erecting a $75,000 school.

**Hornellsville, N. Y.*—Peter McManus, of Bradford, Pa., it is reported, has received the contract to erect an addition to Irving School at $14,750.

Little Valley, N. Y.—The citizens have voted in favor of erecting an addition to the high school at a cost of $12,000.

Toledo, O.—It is reported that the School Bd. has authorized the expenditure of $20,000 for school repairs. Address Secy. Bd.

Greenburg, Pa.—It is reported that bids will be received until Aug. 17 for erecting an 8-room school in South Greenburg. A. G. Wengert, Secy. School Bd.

Millersville, Pa.—Seymour & Paul A. Davis, 3d., of Philadelphia, are preparing plans for a normal school at Millersville. It will be a 3-story stone and brick structure, to cost $75,000.

Paradise, Pa.—It is reported that the R. C. Church intends erecting a $20,000 school for boys.

Wilkesbarre, Pa.—It is reported that the St. Mary's R. C. Church will erect a $70,000 school. Rev. R. A. McAndrew, Pastor.

Pawtucket, R. I.—The erection of a 12-room school in the Prospect St. Dist. is reported under consideration.

**Eau Claire, Wis.*—Hoeppner, Bartlett & Co., of Eau Claire, it is reported, have secured the contract to erect the parochial school for the St. Patrick R. C. Church, at a cost of $28,125.

West Allis, Wis.—C. L. Lesser, of Milwaukee, it is stated, has about completed plans for the 2-story brick school which is to be erected on National Ave. at a cost of $30,000.

Madison, Wis.—The citizens, it is stated, on July 25, voted in favor of issuing $250,000 bonds to erect a high school.

STREET CLEANING AND GARBAGE DISPOSAL.

Notes Arranged Alphabetically by States.

Chicago Ill.—Bids will be received until Sept. 1 by the Dept. Pub. Wks. (Jos. M. Patterson Comr.) for furnishing materials for the collection removal and disposition of garbage.

New York, N. Y.—The following are the bids opened on Aug. 7 by John McG. Woodbury, Comr. of Street Cleaning, for removal of snow and ice in the 7th Dist., Boro. of Manhattan (price given per cu. yd.): Wm. Bradley, 86th St. & Bway., 5 cts.; Uvalde Asphalt Paving Co., Bway., 14 cts. and Thos. Crimmins Constr. Co., 69th St. & Ave. A, 15 cts.

**Philadelphia, Pa.*—Henderson & Co., 1221 Arch St., are reported to have secured the contract for a garbage incinerating plant for the Penn Reduction Co., at 51st St. and Schuylkill Ave. The cost will be $40,100. The plant will consist of a 2-story frame digester house, 82x142 ft.; 1-story brick boiler house, 45.4x156.6 ft.; 1-story frame engine house, 22x100 ft., and 1-story frame grease house, 20x96 ft.

**Items marked thus give the names of parties awarded contracts.*

Philadelphia, Pa.—Press reports state that bids will be received until Aug. 23 by Dir. Pub. Wks. Acker for cleaning the streets throughout the year 1906.

NEW INDUSTRIAL PLANTS.

See also Business Buildings.

The Sullivan Machinery Company is making important additions to its manufacturing plant at Claremont, N. H., in order to handle the rapid growth of business in air compressors, coal cutters, rock drills and other mining and quarrying machinery. The improvements comprise six new buildings, practically doubling the present plant.

A cement plant, costing about $400,000 will be constructed at Baker City, Skagit County, Wash., by the Washington Portland Cement Co., of Seattle. Power will be furnished electrically from a plant on the Skagit River, and work has already started on this part of the undertaking. The president of the company is H. N. Anderson; vice-president, A. S. Austin; secretary, E. E. Caine; treasurer, S. M. Anderson; general manager, E. C. Miller.

Prairieville (Tex.) Gin & Mill Co. is erecting a new plant, consisting of main building, 20x52 ft., 22 ft. high, and boiler and engine room adjoining, 28x30 ft.

Jamestown (N. Y.) Panel & Veneer Co. will begin at once rebuilding their plant, which was recently destroyed by fire. The new building will be constructed of cement blocks and will measure 80x120 ft., with 2 stories and basement.

Missouri, Kansas & Texas Ry. Co., will shortly begin erecting a new shop at Hannibal, Mo. The new building will be of brick and stone and will measure 84x48 ft. In addition to this will be an oil house, 16x20 ft. A boiler and a number of small tools will be required.

The Whitaker-Harvey Co., Winston-Salem, N. C., will make additions to present plant, which will double its capacity.

A. W. Ashford & Sons, Watkinsville, Ga., are contemplating the erection in the near future of a large cotton mill.

The Lytle-Stoppenbach Co., Milwaukee, Wis., manufacturers of malt, will build a fireproof cleaning elevator to replace elevator recently destroyed by fire.

Germain & Boyd Lumber Co., Saginaw, Mich., has recently purchased a large tract of lumber land in Louisiana and are planning to erect a large saw mill plant.

Crescent Mfg. Co., Spartanburg, S. C., will increase its plant by the addition of 40 latch needle machines, spliced knee attachments, and dye-house machinery.

Fenn Bros. Co., Leavenworth, Kan., have purchased a tract of land in South Memphis and will shortly begin the erection of a large woodworking factory having a capacity of 30,000 feet daily. A 300-h.p. plant will be installed.

Lucern Products Co., Omaha, Neb., is erecting a plant for the manufacture of feed from alfalfa, and is in the market for belting, shafting hangers, pulleys; also a 150-kw. generator, one 115-hp. motor and a number of smaller motors of 5 to 20 hp.

S. H. Kelsey & Co., Crystal River, Fla., will build large plant for the manufacture of hardware lumber and veneers. Considerable machinery will be installed.

Poland Paper Co., Mechanic Falls, Me., will build an addition to its plant measuring 70x75 ft., to be used as machine shop and storage house.

Wytheville (Va.) Ice & Dairy Co. is contemplating the addition of a bottling department to its present plant.

Bernstein Mfg. Co., Philadelphia, Pa., is erecting new foundry building, 50x201 ft., with cupola wing, core shop and oven, and will install 8-ton cupola, 10-ton crane and sand blast equipment.

MISCELLANEOUS.

Notes Arranged Alphabetically-by States.

Mobile, Ala.—Bids will be received until Sept. 5 by Maj. W. E. Craighill, Corps Engrs., U. S. A., for dredging in Mobile harbor, as advertised in The Engineering Record.

San Francisco, Cal.—Bids will be received until Sept. 12 by the Bureau of Supplies & Accounts, Navy Dept., Washington, D. C., for furnishing at the Navy Yard, Mare Island, Cal., a cantilever crane.

Washington, D. C.—Bids will be received until Aug. 22 by Jas. Knox Taylor, Superv. Archt., Treas. Dept., for installing an electric passenger and freight elevator in the West Out Bldg., Bureau of Engraving and Printing.

New London, Conn.—The following are the bids opened Aug. 3 by Lieut. Col. C. F. Powell, Corps Engrs., U. S. A., for dredging and rock removal: (*a*) Atlantic Dredging Co., New York, N. Y., (*b*) John P. Randerson, Albany, N. Y.

	a.	*b*
Dredg. Southport Harb., 36,000 cu. yds.	$.24	$.26
Rock Removal, Southport Harbor, 100 cu. yds.	13.00	28.00
Dredging 5 mile River Harbor, 30,000 cu. yds.	.18	.14½
Dredging Greenwich Harbor, 31,000 cu. yds.	.17	.14½
Total	$20,695	$21,077
Dredging 6 ft. channel, Norwalk Harbor, 8,000 cu. yds.	$.25	
Dredging 9 ft. channel, Norwalk Harbor, 20,000 cu. yds.	.16	
Dredging 7 ft. channel, Stamford Harbor, 50,000 cu. yds.	.24½	
Total	$17,850	

Washington, D. C.—See "Power Plants, Gas and Electricity."

Miami, Fla.—Bids will be received until Sept. 5th by the Bd. Co. Comrs. for excavating approximately 1,000,000 cu. yds. of sand and muck in constructing a main canal, approximately 10 miles long, also 15 miles of laterals requiring the excavating of about 307,000 cu. yds. of sand and muck, these operations lying immediately west of Lake Worth in Dade County, Fla., as adveritsed in The Engineering Record.

Pensacola, Fla.—See "Power Plants, Gas and Electricity."

Chicago, Ill.—Bids will be received until Aug. 30 by the Bd. Trus. Sanitary Dist., 1110 Security Bldg. (S. D. Griffin, Clk.) for $1,000,000 Sanitary Dist. bonds.

Chicago, Ill.—Bids will be received until Aug. 16 by the South Park Comrs. (Edw. G. Shumway, Secy.) for furnishing materials and constructing 1,200 ft. concrete wall in Jackson Park, shelter and wall in Armour Sq., and a shelter in Davis Sq.

**Rensselaer, Ind.*—Wm. Gundrum, of Royal Center, is reported to have secured the contract for dredging 17 miles of ditch in Jasper County.

Greenfield, Ind.—O. H. Monger, County Engr., writes that the committee will report on Sept. 25 on the straightening of Brandywine Creek; probable cost, $50,000.

**Plymouth, Ind.*—John C. Butler, Construction Engr., Plymouth, writes that the contract for constructing Wolf Creek Ditch (bids opened Aug. 7) has been awarded to E. A. France & Sons, of Ft. Wayne, for $8,875.

South Bend, Ind.—It is proposed to erect a green house in Leeper Park, to cost about $10,000. Herman Beyser, Supt. Parks.

New Orleans, La.—Bids will be received at the Bureau of Supplies & Account, Navy Dept., Washington, D. C., for furnishing at the Naval Station, New Orleans, a quantity of machine tools as follows: Planing machine, boring and turning mill, drills, drill pressers, milling machines, pipe threading and cutting machine, steel shafting, motors, etc.

Boston, Mass.—Bids will be received until Aug. 17 by Wm. Jackson, City Engr., for the iron railing of Atlantic Ave. extension.

**Boston, Mass.*—The Bay State Dredging Co., 19 High St., secured the contract from the Bd. of Harbor and Land Comrs. at the following bid on Aug. 1 for 3,750 cu. yds. dredging at Paskamansett River, 48 cts. per cu. yd.; 6,500 cu. yds. at Lewis Bay, 40 cts., and 10,000 cu. yds. at Witchmere Harbor, for a lump sum of $3,825.

Bids will be received until Aug. 24 by the Harbor & Land Comrs. for building breakwater in Vineyard Haven Harbor, to be about 700 ft. long and requiring about 8,000 to 9,000 tons of stone.

Detroit, Mich.—The construction of the Detroit tunnel line, from Windsor, Ont., to West Detroit yard, Mich., including the electrification, is stated to have been placed in charge of an advisory board of engineers, consisting of Wm. J. Wilgus, vice-pres. N. Y. C. & H. R. R. R.; Howard Carson, Consulting Engr., and W. S. Kinnear, Ch. Engr. of the Tunnel Co. The Chief Engineer will be in charge of construction, reporting to H. B. Ledyard, Chmn. Bd. of Directors on executive and financial matters, and to the Bd. of Advisory Engrs., as to plans, specifications and methods of doing the work.

Petoskey, Mich.—Bids will be received until Sept. 6 by Col. M. B. Adam, Corps Engrs. U. S. A., Grand Rapids, for extension of west breakwater at Petoskey, as advertised in The Engineering Record.

St. Louis, Mo.—Bids will be received by Maj. Thos. L. Casey, Corps Engrs., U. S. A., until Sept. 8 for furnishing dredging pumps, pillow blocks, etc., as advertised in The Engineering Record.

Glendive, Mont.—The following are the bids opened July 31 at the office of the engineer U. S. Reclamation Service for furnishing 12,000 bbls. cement f. o. b. cars Glendive. (F. E. Weymouth, of Glendive, Project Engr.) (*a*) Illinois Steel Co., 1057 The Rookery, Chicago, Ill.; (*b*) Alpha Portland Cement Co., 410 Pioneer Press Bldg., St. Paul, Minn.; (*c*) Atlas Portland Cement Co., 30 Broad St., New York, N. Y.

	Quantity in bbls.	Price at works.	Price at Glendive.	Total at works.	Total at Glendive.
a	12,000	$1.00	$2.82	$12,000	$33,840
b	12,000	1.37	†3.29	16,440	39,480
c	12,000	....	2.97	......	‡35,640

†Price includes 40 cts. per bbl. for sacks, and this amount will be refunded on return of sacks in good condition, to Duluth, Minn., freight prepaid; and that the delivered price is based on regular tariff rates at 40 cts. per 100 lbs.

‡Shipment can only be made during period of open navigation on Lakes.

New York, N. Y.—Bids will be received until Sept. 7 by Col. W. R. Livermore, Corps Engrs. U. S. A., Army Bldg., for dredging and rock removal in East River and Hell Gate, N. Y., as advertised in The Engineering Record.

Bids will be received until Sept. 16 by Mordecai T. Endicott, Ch. Bureau of Yards & Docks, Navy Dept., Washington, D. C., for a 15-ton auxiliary hoist for a 100-ton crane, at the Navy Yard, New York.

Bids will be received until Aug. 23 by Jas. Knox Taylor, Superv. Archt., Treas. Dept., Washington, D. C., for installing an electric freight elevator in the U. S. Post-office and Courthouse at New York.

Brooklyn, N. Y.—Work will probably begin in the fall on the steel pier to be constructed at Coney Island Ave. and Brighton Beach, by the Brighton Beach Development Co., of which W. A. Brady is the principal promoter.

Bids will be received until Aug. 21 by Thos. W. Churchill, Deputy and Acting Fire Comr., N. Y. City, for furnishing material and placing conduits for the Fire Dept. telegraph and alarm system underground in the Boro. of Brooklyn, and for alterations and additions to the fire alarm telegraph system in the Boro. of Richmond.

Portsmouth, N. H.—Bids will be received until Aug. 26 by Mordecai T. Endicott, Ch. Bureau Yards and Docks, Navy Dept., Washington, D. C., for a 100-ton railroad and wagon scale at the navy yard here; estimated cost, $4,000.

Laconia, N. H.—The City Council has decided to reconstruct canal across Bank Square, with concrete, at a cost of about $6,500. F. G. Berry, City Engr.

**Cincinnati, O.*—The Carroll Constr. Co., of St. Louis, Mo., has secured the contract for grading site, etc., of Cincinnati Hospital (bids opened Aug. 2 by the Bd. of Pub. Service) at the following bid: 206,000 cu. yds. grading, 36.4 cts.; removing macadam, 1,650 cu. yds., 60 cts.; removing curb and gutters, 3,900 lin. ft., 25 cts., and for 10 cu. yds. brick masonry, $12; total, $77,069. Schillinger Bros. Co., of Chicago, Ill., secured the contract for constructing retaining wall for $9,371.

Panama.—The following are the bids opened on Aug. 5 by the Isthmian Canal Comn., Washington, D. C., for 20,000 bbl. Portland cement (price given per bbl.): Alfred Hillyer, New Orleans, La., $2.47; Linden & Molo, Dubuque, Ia., $2.11, and Alpha Cement Co., Easton, Pa., $2.40.

Philadelphia, Pa.—Bids will be received until Aug. 22 by the Bureau of Supplies & Accounts, Navy Dept., Washington, D. C., for furnishing at the Navy Yard, League Island, Pa., 1,000 tons broken stone and 1,750 oak ties. H. T. B. Harris, Paymster Gen., U. S. N.

Pittsburg, Pa.—Wm. J. Weisman, Andrew B. Harper and others are about to apply for a charter for the Oakland Tunnel Co., which proposes constructing a tunnel from Elm and Clark Sts., 7th Ward, to Forbes St. and Oakland Ave., 14th Ward. The same people are also the incorporators of the Duquesne Tunnel Co., which is to construct a tunnel from 7th Ave. and Grant Boule. to Craig St.

Charleston, S. C.—Bids will be received until Sept. 9 by Capt. G. P. Howell, Corps Engrs., U. S. A., for dredging canal between Charleston Harbor and Bulls Bay, S. C., as advertised in The Engineering Record.

Cape Charles, Va.—The following are the bids opened on Aug. 3 by Capt. E. Eveleth Winslow, Corps Engrs. U. S. A., Norfolk, for dredging at Cape Charles; 70,000 cu. yd., price given per cu. yd.: River & Harbor Improv. Co., Philadelphia, Pa., 23.5 cts.; J. L. Grim, Philadelphia, Pa., 19⅜ cts.; Coastwise Dredging Co., Norfolk, 20.9 cts.; Maryland Dredging & Contr. Co., Baltimore, Md., 22 cts.; McLean Contr. Co., Baltimore, Md., 24.5 cts., and Norfolk Dredging Co., Norfolk, 25 cts.

Portland, Ore.—Bids were opened on July 24 by Maj. W. C. Langfitt, Corps Engrs., U. S. A., for constructing a portion of The Dalles-Celilo Canl, in connection with the work of improving Columbia River at Three Mile Rapids, Oregon and Washington. Bids were submitted on three different designs as follows: (1) Design A, using reinforced concrete for portion of river and land walls, and plain concrete for remaining work; (2) Design C, using plain concrete for entire work; (3) rubble design, using rubble masry. for river and land walls (increasing section where necessary), in design C, and using plain concrete for remaining work. (*a*) International Contr. Co., Seattle, Wash., (1) $426,122, (2) $447,874; (*b*) John Kiernan, Portland, (1) $351,170, (2) $351,917, (3) $354,187; (*c*) Burrell Constr. Co., Portland, (1) $545,788, (2) $616,138, (3) $826,138; (*d*) Joseph Paquet & Anton Giebisch, Portland, (1) $337,498, (2) $341,948, (3) $421,948; (*e*) J. W. Sweeney, Portland, (1) $371,720, (2) $405,695, (3) $433,695; (*f*) Robt. Wakefield, Portland, (1) $353,066, (2) $349,366; (*g*) Prendergast & Clarkson, Chicago, Ill., (1) $359,920, (2) $381,595, (3) $384,395; (*h*) Smyth & Jones, Portland, (1) $297,304; (2) $294,261, (3) $374,171; (*i*) Pacific Coast Constr. Co., Portland, (1) $367,567, (2) $347,605, (3) $468,105; (*j*) Puget Sound Bridge & Dredging Co., Seattle, Wash., (1) $343,840, (2) $365,686. The Burrell Constr. Co. submitted a bid of $555,288 on his own design for reinforced concrete walls.

	Concrete plain					Excavation						Reinforcing rods (medium steel.)			
	Design A, 13,000 cu. yds.	Design C, 33,000 cu. yds.	Rubble design, 10,000 cu. yds.	Reinforced concrete, Design A, 9,800 cu. yds.	Rubble design, Rubble masry. 27,000 cu. yds.	Solid rock, 81,000 cu. yds.	Sand, 12,000 cu. yds.	Common, 43,000 cu. yds.	Rip rap, hand placed, 9,000 cu. yds.	Test and anchor holes, 200 lin. ft.	Structural steel shapes, 3,000 lbs.	Design A, 950,000 lbs.	Design C, 105,000 lbs.	Rubble design, 105,000 lbs.	Asphaltic cement, 27 tons.
a	$8.10	$8.10	....	$11.25	....	$1.50	$.55	$.55	$2.50	$2.00	$.10	$.0355	$.0355	....	$40.00
b	7.40	6.71	6.71	9.90	$5.80	.89	.39	.47	2.50	2.00	.25	.0325	.0325	.0325	40.00
c	12.00	12.00	12.00	13.00	18.00	2.00	.50	.40	3.00	.25	.07	.05	.05	.05	50.00
d	6.50	6.50	6.50	8.50	8.50	.90	.20	.50	2.00	.75	.25	.05	.05	.05	25.00
e	7.50	7.00	7.00	8.00	7.00	1.50	.40	.50	2.00	2.00	.05	.025	.025	.025	50.00
f	8.50	6.90	....	9.75	....	.94	.20	.38	2.25	.40	.10	.03	.03	....	30.00
g	7.45	7.45	7.45	8.25	6.45	.98	.18	.60	1.95	1.00	.085	.055	.055	.055	25.00
h	5.60	5.33	5.33	8.20	7.50	.90	.185	.37	1.85	2.50	.125	.0305	.0305	.0305	50.00
i	6.50	6.50	6.50	12.50	10.00	1.00	.25	.50	2.00	1.00	.06	.0325	.0325	.0325	40.00
j	6.40	6.15	....	7.30	....	1.30	.35	.40	2.85	.90	.15	.0312	.0312	....	80.00

**Items marked thus give the names of parties awarded contracts.*

**Everett, Wash.*—The contract for building the Ebey Island dike is reported to have been awarded to H. D. Benson, of Ladner, B. C., for about $49,000.

Seattle, Wash.—The following are the bids opened on Aug. 3 by Maj. John Millis, Corps Engrs., U. S. A., for dredging Lake Washington Canal, 300,000 cu. yds. (price given per cu. yd.): International Contract Co., Seattle, 46 cts.; North American Dredging Co., San Francisco, Cal., 43.7 cts., and Puget Sound Bridge & Dredging Co., Seattle, 35.9 cts.

Milwaukee, Wis.—The Milwaukee Gas Light Co. is reported to have decided to construct a tunnel under the river at Jefferson St.

Guantanamo, Cuba.—Bids will be received until Sept. 9 by Mordecai T. Endicott, Ch. Bureau of Yards & Docks, Navy Dept., Washington, D. C., for a self-propelling derrick of about 250 tons capacity for the naval station at Guantanamo.

PROPOSALS OPEN

Proposals see pages 56, 60, 61, 62 AND 63

WATER WORKS.

Bids Close.		See Eng. Record.
Aug. 15.	Reservoir, etc., Ft. McPherson, Ga. Adv. Jul. 22 to Aug. 5.	Jul. 22
Aug. 15.	Reservoir embankm't, Mt. Vernon, Ill. Adv. Aug. 5.	Aug. 5
Aug. 15.	Meters, etc., Washington, D. C.	Aug. 5
Aug. 15.	Cisterns, Ft. Caswell, N. C.	Aug. 5
Aug. 15.	Water works improv., Uxbridge, Mass. Adv. Aug. 5, 12.	Aug. 5
Aug. 15.	Pumping engine, Edmonton Alta, Can.	Aug. 5
Aug. 16.	Dam, etc., Casper, Wyo. Adv. Jul. 22 to Aug. 12.	Jul. 22
Aug. 16.	Pumping plant, engine, etc., Brooklyn, N. Y.	Aug. 5
Aug. 16.	Monitors, New York, N. Y.	Aug. 5
Aug. 16.	System, West Allis, Wis.	Aug. 12
Aug. 16.	Pump house, etc., Prince Albert, N. W. Ter.	Aug. 12
Aug. 17.	Irrigation, Yuma, Ariz. Adv. Jun. 17 to Jul. 22.	Jun. 17
Aug. 17.	Pump, machinery, Chicago Junction, O.	Aug. 12
Aug. 18.	Mains, White Hall, Ill.	Aug. 5
Aug. 21.	Water-wks. extension, Idaho Springs, Colo.	Aug. 12
Aug. 21.	Water-wks., St. Cloud, Minn.	Aug. 12
Aug. 21.	Reservoir, etc., Coatesville, Pa.	Aug. 12
Aug. 22.	Water-wks. Arlington, Neb.	Aug. 12
Aug. 22.	C. i. pipe, Chicago, Ill.	Aug. 12
Aug. 22.	Pumps, Thief River Falls, Minn.	Aug. 12
Aug. 24.	System, Marksville, La. Adv. Aug. 5.	Jul. 29
Aug. 24.	Water-wks., Enderlin, N. D.	Aug. 12
Aug. 25.	Pipe, etc., Panama Adv. Jul. 29 to Aug. 12.	Jul. 29
Aug. 25.	Water-wks., Fredericktown, O. Adv. Aug. 12.	Aug. 12
Aug. 26.	Reservoir, Ft. Moultrie, S. C.	Jul. 29
Aug. 26.	Boiler, Ft. Ringgold, Tex.	Jul. 29
Aug. 28.	Canal, etc., Montrose, Colo. Adv. Jul. 15 to Aug. 5.	
Aug. 28.	Pumping plant, Winnipeg, Man. Adv. Aug. 5.	Aug. 5
Aug. 28.	Water-wks., Monroe, Ga. Adv. Aug. 12.	Aug. 12
Aug. 29.	Pipe, etc., Cincinnati, O.	Aug. 12
Aug. 31.	Water-wks., Owensboro, Ky.	Aug. 12
Aug. —.	Improv., Donalsonville, La.	Jul. 15
Sep. 2.	Pumping unit, Niagara Falls, Ont. Adv. Aug. 5, 12.	Aug. 5
Sep. 2.	Boiler, Ft. Brown, Tex.	Aug. 12
Sep. 2.	Chimney, Erie, Pa.	Aug. 12
Sep. 4.	Conduit, Salt Lake City, Utah Adv. Aug. 12.	Aug. 12
Sep. 4.	Reservoir, Wilmington, Del. Adv. Aug. 12.	Aug. 12
Sept. 5.	Dam, etc., Cody, Wyo. Adv. Jul. 15 to Aug. 5.	Jul. 15
Sep. 5.	Standpipe, Stromsburg, Neb.	Aug. 12
Sept. 6.	Tunnel, etc., Cody, Wyo. Adv. Jul. 15 to Aug. 5.	Jul. 15
Sep. 7.	Conduit, Toledo, O.	Aug. 12
Sep. 14.	Pumping machinery, Columbus, O. Adv. Aug. 5, 12.	Aug. 5
Sep. 19.	Pumps, etc., Toronto, Ont. Adv. Aug. 5, 12.	Aug. 5
Sep. 26.	Tunnel, Montrose, Colo. Adv. Aug. 12.	Aug. 12
Oct. 12.	Sale of standpipe, Attleboro, Mass. Adv. Jul. 29 to Aug. 5.	Jul. 29
———	Water wks. or franchise, Muncie, Ind. Adv. Jul. 29.	Jul. 29

SEWERAGE AND SEWAGE DISPOSAL.

Aug. 15.	New Britain, Conn. Adv. Jul. 29 to Aug. 5.	Jul. 29
Aug. 15.	Rensselaer, N. Y.	Aug. 12
Aug. 15.	Toronto, Ont.	Aug. 12
Aug. 16.	Winchester, Ind.	Jul. 29
Aug. 16.	Brooklyn, N. Y.	Aug. 12
Aug. 16.	Mt. Oliver, Pa.	Aug. 12
Aug. 16.	Marion, O.	Aug. 12
Aug. 16.	West Allis, Wis.	Aug. 12
Aug. 16.	West Hoboken, N. J.	Aug. 12
Aug. 18.	Hopkinsville, Ky.	Aug. 12
Aug. 19.	Norwood, O.	Jul. 29
Aug. 19.	Chicago, Ill.	Aug. 12
Aug. 21.	Steubenville, O. Adv. Jul. 29 to Aug. 12.	Jul. 29
Aug. 21.	Dist. sewers, Washington, D. C. Adv. Aug. 12.	Aug. 12
Aug. 21.	C. i. pipe, etc., Washington, D. C. Adv. Aug. 12.	Aug. 12
Aug. 21.	Tulsa, Ind. Ter.	Aug. 12
Aug. 21.	Berea, O.	Aug. 12
Aug. 21.	Sheridan, Wyo.	Aug. 12
Aug. 21.	Cincinnati, O.	Aug. 12
Aug. 22.	Portland, Me.	Aug. 12
Aug. 23.	Chicago, Ill. Adv. Jul. 29 to Aug. 12.	Jul. 29
Aug. 23.	Portland, Me.	Aug. 12
Aug. 23.	Des Moines, Ia.	Aug. 12
Aug. 24.	Clinton, Ia.	Jul. 29
Aug. 25.	Rockford, Ill. Adv. Aug. 12.	Aug. 12
Aug. 28.	Ames, Ia. Adv. Aug. 12.	Aug. 12
Sep. 1.	Kenton, O.	Aug. 5
Sep. 1.	South Bend, Ind.	Aug. 12
Sep. 2.	Newton, N. J. Adv. Aug. 12.	Aug. 12
Sep. 5.	Harrison, N. J.	Aug. 12

BRIDGES.

Aug. 15.	St. Clairsville, O.	Jul. 29
Aug. 15.	Napa, Cal.	Aug. 5
Aug. 15.	Spartanburg, S. C.	Aug. 12
Aug. 16.	Cleveland, O.	Jul. 29
Aug. 16.	Ithaca, N. Y.	Aug. 5
Aug. 17.	Racine, Wis.	Aug. 12
Aug. 19.	Norristown, Pa.	Jul. 29
Aug. 19.	Hays, Pa.	Aug. 12
Aug. 21.	Bowling Green, O.	Aug. 5
Aug. 21.	Concord, Me.	Aug. 5
Aug. 21.	Chillicothe, O.	Aug. 5
Aug. 21.	Huntington, W. Va.	Aug. 5
Aug. 26.	Dayton, O.	Aug. 12
Sep. 2.	Norristown, Pa.	Aug. 12
Sep. 4.	Mandan, N. D.	Aug. 12
Sep. 5.	Columbus, O.	Aug. 12
Sept. 8.	Virginia City, Mont.	Jul. 22
Sep. 30.	San Juan, P. R.	Aug. 5
Oct. 1.	Pensacola, Fla.	Aug. 12
Oct. 4.	Superstructure, Chicago, Ill.	Aug. 12
Oct. 4.	Substructure, Chicago, Ill.	Aug. 12

PAVING AND ROADMAKING.

Aug. 14.	Jersey City, N. J.	Aug. 12
Aug. 15.	Crownpoint, Ind.	Jul. 22
Aug. 15.	Mobile, Ala.	Jul. 29
Aug. 15.	Washington, D. C.	Aug. 5
Aug. 15.	Suffolk, Va.	Aug. 5
Aug. 15.	Peru, Ill.	Aug. 12
Aug. 15.	Memphis, Tenn.	Aug. 12
Aug. 15.	Toronto, Ont.	Aug. 12
Aug. 15.	Lancaster, O.	Aug. 12
Aug. 16.	Newburgh, N. Y.	Aug. 5
Aug. 16.	Brooklyn, N. Y.	Aug. 5
Aug. 16.	Marinette, Wis.	Aug. 12
Aug. 16.	Glassport, Pa.	Aug. 12
Aug. 17.	Cincinnati, O.	Jul. 29
Aug. 17.	Towson, Md. (2 proposals) Adv. Aug. 5.	Aug. 5
Aug. 17.	Greensboro, N. C. Adv. Aug. 5, 12.	Aug. 5
Aug. 17.	Concord, N. H.	Aug. 12
Aug. 17.	Brick plant, Detroit, Mich.	Aug. 12
Aug. 17.	Wilmington, Del.	Aug. 12
Aug. 18.	Wyandotte, Mich.	Aug. 12
Aug. 19.	Norwood, O.	Jul. 29
Aug. 19.	Seattle, Wash.	Aug. 12
Aug. 19.	Boston, Mass.	Aug. 12
Aug. 21.	Johnstown, N. Y.	Jul. 22
Aug. 22.	Alliance, O.	Aug. 5
Aug. 22.	Upper Marlboro, Md.	Aug. 12
Aug. 22.	Bedford, Ind.	Aug. 12
Aug. 22.	Cincinnati, O.	Aug. 12
Aug. 23.	Madisonville, O.	Aug. 5
Aug. 28.	Asphalt plant, New Orleans, La. Adv. Jul. 29 to Aug. 12.	Jul. 29
Aug. 29.	Portsmouth, O.	Aug. 12
Aug. 29.	Cleveland Heights, O.	Aug. 12
Aug. 30.	Madison, Wis.	Aug. 12
Sep. 1.	Ft. Hancock, N. J.	Aug. 12
Sep. 1.	Wallace, Idaho	Aug. 12
Sep. 5.	Norwalk, O.	Aug. 5
Sep. 5.	Harrison, N. J.	Aug. 12
Sep. 5.	Columbus, O.	Aug. 12
Sep. 5.	Cincinnati, O.	Aug. 12

POWER, GAS AND ELECTRICITY.

Aug. 15.	Campbellsville, Ky.	Jun. 24
Aug. 15.	Electric light fixtures, Pekin, Ill.	Jul. 29
Aug. 15.	Russell, Ky.	Jul. 29
Aug. 15.	Pulaski, Va.	Jul. 29
Aug. 15.	Philadelphia, Pa.	Aug. 12
Aug. 15.	St. Louis, Mo.	Aug. 12
Aug. 19.	Ft. Myer, Va. Adv. Jul. 29 to Aug. 12.	Jul. 29
Aug. 17.	Chicago, Ill.	Aug. 12
Aug. 21.	Moose Jaw, N. W. Ter.	Aug. 5
Aug. 21.	Ft. Omaha, Neb.	Aug. 12
Aug. 21.	Long Island City, L. I., N. Y.	Aug. 12
Aug. 21.	Far Rockaway, N. Y.	Aug. 12
Aug. 22.	Supplies, Washington, D. C.	Aug. 12
Aug. 23.	Burlington, Vt.	Aug. 12
Aug. 24.	Fort Wayne, Ind.	Jul. 8
Aug. 24.	Marksville, La. Adv. Aug. 5.	Jul. 29
Aug. 28.	Washington, D. C. Adv. Jul. 29 to Aug. 12.	Jul. 29
Aug. 28.	Winnipeg, Man. Adv. Aug. 5, 12.	Aug. 5
Aug. 28.	Florence, S. C.	Aug. 12
Aug. 29.	Supplies, Pensacola, Fla.	Aug. 12
Aug. 29.	Boilers, etc., Washington, D. C.	Aug. 12
Aug. —.	Waukegan, Ill.	Jul. 29
Sep. 5.	Supplies, Washington, D. C.	Aug. 12
Sep. 6.	Ukiah, Cal.	Aug. 5
Sep. 30.	Washington, D. C. Adv. Aug. 5.	Aug. 5
Oct. 1.	**Tacoma, Wash.**	**Jul. 8**

BUILDINGS.

Aug. 14.	Boathouse, Brooklyn, N. Y.	Aug. 12
Aug. 15.	Pub. bldgs, htg., etc., New York, N. Y. Adv. Jul. 29 to Aug. 5.	Jul. 29
Aug. 15.	School plans, Laurel, Miss.	Jul. 29
Aug. 15.	Jail improv., Crookston, Minn.	Jul. 29
Aug. 15.	School, Grindstone City, Mich.	Aug. 5
Aug. 15.	Court house, Choteau, Mont.	Aug. 5
Aug. 15.	Remov. pub. bldg., St. Louis, Mo.	Aug. 5
Aug. 15.	Hospitals, Kansas City, Mo.	Aug. 5
Aug. 15.	School, Newark, N. J.	Aug. 12
Aug. 15.	Home, Indianapolis, Ind.	Aug. 12
Aug. 15.	School, St. Clair Heights, Mich.	Aug. 12
Aug. 16.	P. O., McKeesport, Pa.	Jul. 15
Aug. 16.	Post bldgs., Ft. Mott, N. J. Adv. Jul. 22 to Aug. 12.	Jul. 22
Aug. 16.	School, Youngstown, O.	Jul. 29
Aug. 16.	School library, Bloomington, Ind.	Aug. 5
Aug. 16.	School, Boston, Mass.	Aug. 12
Aug. 17.	Lighthouse, Buffalo, N. Y.	Jul. 15
Aug. 17.	P. O. extension, Burlington, Ia.	Jul. 15
Aug. 17.	School bldgs., Hayward, Wis.	Jul. 29
Aug. 17.	Pub. bldg., Cooperston, Ill.	Aug. 5
Aug. 17.	Post bldgs., Ft. Robinson, Neb.	Aug. 12
Aug. 17.	School, Greenburg, Pa.	Aug. 12
Aug. 18.	Htg., etc., pub. bldg., New York, N. Y.	Aug. 12
Aug. 18.	School, Red Wing, Minn.	Aug. 12
Aug. 18.	Pub. bldgs., New York, N. Y.	Aug. 12
Aug. 19.	Pub. bldg., Portsmouth, N. H.	Jul. 29
Aug. 19.	School, Duluth, Minn.	Aug. 12
Aug. 21.	Hospital, Southport, N. C.	Jul. 22
Aug. 21.	Plumbing, htg., etc., college, Ithaca, N. Y. Adv. Aug. 5, 12.	Aug. 5
Aug. 21.	Court house, Caldwell, Idaho	Aug. 5
Aug. 21.	Pub. bldg., Washington, D. C.	Aug. 12
Aug. 21.	School, Englewood, N. J.	Aug. 12
Aug. 21.	Repair pub. bldgs., New York, N. Y.	Aug. 12
Aug. 21.	Plumb., etc., in engine house, New York, N. Y.	Aug. 12
Aug. 21.	Bank, Hamilton, Ont.	Aug. 12
Aug. 22.	School, Santa Fe, N. M.	Jul. 29
Aug. 22.	School, Kosciusko, Miss.	Aug. 12
Aug. 23.	Hospital, Philadelphia, Pa.	Aug. 12
Aug. 24.	Htg. P. O. bldg., Lincoln, Neb. Adv. Aug. 5, 12.	Aug. 5
Aug. 24.	Post bldgs., Ft. Wm. H. Seward, Alaska	Aug. 5
Aug. 24.	Hospital, Ft. Washington, Md. Adv. Aug. 12.	Aug. 12
Aug. 24.	Hospital, Sandusky, O.	Aug. 12
Aug. 25.	School, La Moure, N. D.	Jul. 29
Aug. 25.	Post bldgs., Ft. Flagler, Wash.	Aug. 12
Aug. 26.	Htg. hotel, Cincinnati, O.	Jul. 22
Aug. 26.	Court house, Franklinton, La.	Aug. 5
Aug. 28.	Hospital bldgs., Buffalo, N. Y.	Jul. 29
Aug. 28.	Post bldgs., Ft. DuPont, Del. Adv. Aug. 5, 12.	Aug. 5
Aug. 29.	School addition, Lakewood, O.	Aug. 5
Sep. 1.	City hall, plans, Regina, N. W. Ter.	Aug. 5
Sep. 1.	School, Detroit, Mich.	Aug. 12
Sep. 1.	Pub. bldg., La Crosse, Wis.	Aug. 12
Sep. 4.	Htg., etc., courthouse, Huntington, Ind.	Jul. 29
Sep. 4.	Hospital, Little Rock, Ark.	Aug. 12
Sep. 7.	Hospital, Jersey City, N. J.	Aug. 12
Sep. 9.	Pub. bldg., Philadelphia, Pa.	Aug. 12
Sep. 14.	Bus. bldg., St. Louis, Mo.	Aug. 5
Sep. 14.	Lighthouse, Ft. Schuyler, N. Y. Adv. Aug. 12.	Aug. 12
Sep. 30.	Htg., etc., pub. bldg., Washington, D. C. Adv. Aug. 5, 12.	Aug. 5
Oct. 5.	Courthouse, Manhattan, Kan.	Aug. 12

MISCELLANEOUS.

Aug. 15.	Supplies, Washington, D. C.	Jul. 29
Aug. 15.	Cement, etc., Washington, D. C.	Jul. 29
Aug. 15.	Subways, Memphis, Tenn.	Jul. 29
Aug. 15.	Cement, etc., Washington, D. C.	Aug. 5
Aug. 15.	Steps, etc., Newark, N. J. Adv. Aug. 5.	Aug. 5
Aug. 16.	Wall, etc., Chicago, Ill.	Aug. 12
Aug. 17.	Dredging, Norfolk, Va.	Jul. 15
Aug. 17.	Printing presses, etc., Panama Adv. Jul. 22 to Aug. 12.	Jul. 22
Aug. 17.	Broken stone, etc., New York, N. Y.	Aug. 5
Aug. 17.	Railway, Boston, Mass.	Aug. 12
Aug. 18.	Dredging, Newport, R. I. Adv. Jul. 22 to Aug. 12.	Jul. 22
Aug. 18.	Inlet wall, San Francisco, Cal. Adv. Jul. 22 to Aug. 12.	Jul. 22
Aug. 18.	Wall, New York, N. Y.	Aug. 12
Aug. 19.	Dredges, Panama Adv. Jul. 22 to Aug. 5.	Jul. 22
Aug. 19.	Boring in Lake Michigan, Chicago, Ill.	Jul. 29
Aug. 19.	Dredging, Seattle, Wash.	Aug. 5
Aug. 21.	Steel bars, Glendive, Mont. Adv. Jul. 22 to Aug. 5.	Jul. 15
Aug. 21.	Garb. disposal, Indianapolis, Ind.	Jul. 22
Aug. 21.	Crane for sewer, Washington, D. C. Adv. Jul. 22 to 29.	Jul. 22
Aug. 21.	Dredging, Wilmington, Del.	Jul. 29
Aug. 21.	Telegraph systems, Brooklyn, N. Y.	Aug. 12
Aug. 22.	Drills, etc., Panama Adv. Jul. 22 to Aug. 12.	Jul. 22
Aug. 22.	Supplies, Washington, D. C.	Aug. 12
Aug. 22.	Elevator, Washington, D. C.	Aug. 12
Aug. 22.	Stone, Philadelphia, Pa.	Aug. 12
Aug. 23	Elevator, New York, N. Y.	Aug. 12
Aug. 23.	Garb. disposal, Philadelphia, Pa.	Aug. 12
Aug. 24.	Breakwater, Boston, Mass.	Aug. 12
Aug. 26.	**Coal plant, Olongapo, P. I.**	**May 6**
Aug. 26.	Filling etc., Key West, Fla.	Jul. 22
Aug. 26.	Dredging, New London, Conn. Adv. Aug. 5, 12.	Aug. 5
Aug. 26.	Scales, Portsmouth, N. H.	Aug. 12
Aug. 28.	Sanitary fixtures, Panama	Aug. 5
Aug. 28.	R. R. work, Portage la Prairie, Man.	Aug. 12
Aug. 29.	Machines, etc., San Francisco, Cal.	Jul. 29
Aug. 29.	Supplies, Pensacola, Fla.	Aug. 12
Aug. 30.	Breakwater, Newport, R. I. Adv. Aug. 5, 12.	Aug. 5
Aug. 31.	Lock and dam, Nashville, Tenn. Adv. Aug. 5, 12.	Aug. 5
Aug. 31.	Dredging, Portland, Me. Adv. Aug. 5, 12.	Aug. 5
Sep. 1.	Steel and iron, Sydney, N. S. Wales **Adv. Apr. 8, 22; May 6, 20; Jun. 3, 17.** Adv. Jul. 1, 15.	Apr. 8
Sep. 1.	Crane, Augusta, Ga.	Jul. 29
Sep. 1.	Garbage disposal, Chicago, Ill.	Aug. 12
Sep. 5.	Dredging, Oakland, Cal. Adv. Aug. 5, 12.	Aug. 5
Sep. 5.	Supplies, Washington, D. C.	Aug. 12
Sep. 5.	Dredging, Mobile, Ala. Adv. Aug. 12.	Aug. 12
Sep. 5.	Canal, Miami, Fla. Adv. Aug. 12.	Aug. 12
Sep. 6.	Breakwater, Petoskey, Mich. Adv. Aug. 12.	Aug. 12
Sep. 7.	Dredging, New York, N. Y. Adv. Aug. 12.	Aug. 12
Sep. 8.	Dredge pumps, etc., St. Louis, Mo. Adv. Aug. 12.	Aug. 12
Sep. 9.	R. R. work, Miami, Fla. Adv. Jul. 15 to Aug. 12.	Jul. 29
Sep. 9.	Derrick, Guantanamo, Cuba	Aug. 12
Sep. 9.	Dredging, Charleston, S. C. Adv. Aug. 12.	Aug. 12
Sep. 12.	Crane, San Francisco, Cal.	Aug. 12
Sep. 12.	Machine tools, etc., New Orleans, La.	Aug. 12
Sep. 16.	Hoist, New York, N. Y.	Aug. 12
Nov. 1.	**R. R. work, Manila, P. I.** Adv. Jul. 29.	**Jun. 17**
Nov. 9.	Wharf, etc., Havana, Cuba	Jul. 29
Jan. 1.	Statue plans, Indianapolis, Ind.	Jul. 22
Apr. 2,	**'06. Harbor Work, Valparaiso, Chili,** Adv. Apr. 29 to Aug 12.	**Apr. 29**
———	R. R. work, Trinity, Tex.	Aug. 12

**Items marked thus give the names of parties awarded contracts.*